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Economic Condition of the Mining Industries

ALMOST FOUR AND A HALF MILLION long tons of steel ingots was produced in the United States during March, by far the greatest tonnage ever recorded for the steel industry in this country, exceeding the former record of January, 1925, by almost 300,000 long tons. The calendar aided in setting the new record, for the month had twenty-seven working days, but that fact detracts nothing from the interest in the attainment of the phenomenal output. A marked, though perhaps temporary, decline in new orders is currently reported, however, so that some contraction in the producing department may be expected in the later spring months. Steel is one of the barometers of trade, but nothing approaching a business depression is expected by close students of business conditions, who point out that a decline in the volume of manufacturing has occurred in the spring of each of the last three years, and that so long as low interest rates prevail nothing serious should be feared.

Commodity prices have shown a generally declining tendency since last July, and of the twenty-eight groups of commodities whose price indices are given by the Harvard Committee on Economic Research, that for non-ferrous metals ranks the lowest, and that for iron and steel is below the average. Using 100 as a base (the monthly average for 1913), the March price index for the non-ferrous metal group was 109 and for iron and steel, 136, the average for all commodities being 151.5. Other groups that have been selling at comparatively low prices include chemicals, fertilizer materials, and cattle feed. The committee expects the average index of all commodities to remain near 150 for several years, or at approximately the current level, but is careful to explain that, in those particular industries where prices are either considerably higher or lower than the average relative level, the divergence will not necessarily be eliminated. In other words, fundamental conditions in those industries have changed. Steel, for instance, was produced in the record tonnage of March and sold at a price index less than the average for other commodities. This was because of mining and metallurgical improvements and a reduction of costs incident to the enormous tonnage. The same may be said more emphatically for copper; though the price is around the pre-war level, most of the large companies are making satisfactory profits and paying good dividends. Last week an official of a company that mines a fairly low-grade ore made the statement that he considered 14c. a thoroughly satisfactory price for copper.

The metal-mining industries have no cause to feel disgruntled merely because the price index for their groups of products is low; they need not be particularly envious of the anthracite miners, for instance, whose price index is well over 200, or of the woolen industry, whose March price index was 201, but whose principal representative, the American Woolen Co., has recently been passing its dividends. An enormous volume of output at a low price is the fundamental reason for the success of so many American industries, as Henry Ford and others can well attest.

Lead Mining in Bolivia

STIMULATION of lead mining in Bolivia as a result of the rapid rise in the price of that metal is reported. Production has increased rapidly from 8,896 tons in 1923 to 36,837 tons last year, and further increase is thought likely. This production has come from a large number of small mines, situated principally in the southern part of the country and worked by Bolivian, English, and American operators, who have been attracted by the opportunity for profit. Occurrences of lead are reported to be numerous in the highland region of the country lying between the western and eastern Cordilleras from Lake Titicaca to the border of Argentina. Slag dumps, rich in lead, from earlier Spanish operations have also been drawn upon for their contribution to the total. It is said that the interest in lead mining has been sufficient to make it difficult for tin-mining companies, in some parts at least, to maintain an adequate working force. Thus the demand for lead has had far reaching effects. A natural result will probably be the stimulation of interest in deposits of other minerals of economic value. Such interest seems already to have been awakened in antimony.

Spain's Mineral Resources

WITH the Fourteenth International Geological Congress in session in Madrid during May and June, more than ordinary interest attaches at the moment to the mineral resources of Spain. No doubt those who have been in charge of plans for this important convention have taken steps to make it easy for the visitors to obtain such information as they may desire regarding these resources. In any case it may be found in "Mineral Statistics of Spain," the latest volume of which—that for 1924—has just been issued by the Consejo de Mineria at Madrid—a book of over 800 pages.

With many, the famous ancient mines of Rio Tinto mark the beginning and the end of their knowledge of Spanish mines and minerals. But of Spain's forty-nine provinces all but a few are credited with commercial production in 1924. The list of products includes thirty metallic and non-metallic ores and minerals, among them coal, as well as building stones from quarries.

Two provinces, Ciudad Real and Granada, produced the 15,192 tons *(toneladas)* of quicksilver ore recorded, the former, in which the mines of Almaden are situated, giving 14,522 tons of the total, having an average grade of 7 per cent. Granada's small output averaged only one-

tenth as rich. Crude sulphur came from four provinces —Albacete, Almeria, Murcia, and Teruel, the respective outputs being 20,257 tons, 2,213 tons, 2,626 tons, and 39,554 tons, a total of 64,650, which was 721 less than the production of 1923. The average tenor in these provinces ranged from 12 to 25 per cent.

Zinc ore of an average grade of 28 to 44 per cent came from nine provinces in 1924, these yielding a total of 116,721 tons, against 102,313 tons in 1923. The province of Santander led, with 65,506 tons, followed in order by Murcia, with 26,241 tons; Cordoba, with 11,988; and Lerida, with 9,780. Guipuzcoa and Vizcaya followed, with a little over 1,000 tons apiece, the remaining provinces being Almeria, Badajoz, and Granada, with a few hundred tons each.

Copper ore was produced in Huelva and Leon, the output being 283,846 tons, averaging 2.83 per cent, and

Outline map of Spain and Portugal, showing the provinces of the former

20 tons of 10 to 12 per cent ore respectively. This was 28,000 tons more than the year before. On the other hand, the output of copper-bearing pyrites showed a marked decrease over 1923, the two producing provinces of Huelva and Sevilla yielding 1,487,533 tons and 127,700 tons respectively. The larger tonnage averaged 1.15 per cent copper and the smaller 0.9 per cent. The total of 1,615,233 compared poorly with that of 2,163,-554 tons the year before. It is in Huelva that the Rio Tinto mines are situated.

Seventeen provinces produced iron ore to the total amount of 4,612,817 tons, the most important being Vizcaya, with 2,388,097 tons; Almeria, with 608,773; Santander, with 567,039; Teruel, with 451,556; Guadalajara, with 120,573; and Murcia, with 113,912 tons. The total was 1,156,584 tons larger than that of 1923, and, generally speaking, the iron content ranged from 47 to 53 per cent. Oviedo also produced 11,975 tons of manganiferous iron ore. Iron pyrites containing 38 per cent iron and 48 per cent sulphur was produced in Huelva and Murcia to the amount of 592,317 and 4,815 tons respectively. This figure also showed an appreciable increase over that of 1923. Huelva and Oviedo likewise produced 20,840 tons of manganese ore, 18,100 tons of this coming from the former province.

Lead ore was mined in eighteen provinces, the total output being 198,953 tons, compared with 182,135 tons the year before, and the tenor ranging from 35 to 73 per cent. Of the 1924 output the province of Jaen produced 89,041 tons of 65 per cent ore, followed by Cordoba, with 46,085 tons of 67 per cent ore; Murcia, with 23,168 tons averaging 52 per cent; Huesca, with 13,520, Tarragona 9,018, Ciudad Real 5,423, Almeria 4,346, Santander 3,008, Granada 2,316, and Badajoz 1,760 tons. The small balance remaining came from eight provinces.

Spain is not an important producer of gold and silver, the total production of gold ore being 260 tons, from the province of Almeria. The output of silver ore totaled 405 tons, from Guadalajara.

Rock salt to the amount of 105,250 tons was produced in five provinces, the bulk of it in Santander, which yielded 96,850 tons. Salt is also recorded as being produced in four other provinces from mineral springs.

If tonnage alone be considered, mineral waters are by far the leading mineral product of Spain. Four provinces produced 32,401,470 tons of waters of various kinds, the bulk of this, or 32,120,000 tons, coming from Barcelona. Almeria, Malaga, and Tarragona were the other three producers. Of the huge total it may truthfully be said that it was mostly water.

Seventeen provinces were responsible for the output of Spanish coal. Three of them, Cordoba, Leon, and Palencia, produced anthracite to the amount of 316,190 tons. Eleven, including the three already mentioned, had an output of bituminous coal to the amount of 5,811,396 tons, of which 3,978,497 came from Oviedo alone, and 729,024 from Leon. Lignite was produced in eight provinces, the total tonnage being 411,773. Of this, Teruel produced 95,863 tons and Barcelona 87,055.

Of the remaining minerals whose production is recorded, Teruel produced 1,170 tons of refractory clay; Alava and Navarra produced asphalt, the former 5,000 tons and the latter 476. Three provinces, Almeria, Gerona, and Tarragona, produced barytes, mostly of 90 per cent grade, the last-named province's output being 4,016 tons, and Gerona's 2,720; a negligible tonnage was produced in Almeria as a byproduct from lead mining. Cordoba produced 125 tons of bismuth ore; Teruel and Valencia 120 and 635 tons respectively of kaolin; Guipuzcoa 634 tons of fluorspar, as a byproduct of lead mining; Coruña 94,400 tons of tin ore, of an average grade of 20.8 per cent; Almeria and Malaga 1,353 tons and 104 tons, respectively, of steatite or soapstone; Caceres and Murcia 4,746 and 2,000 tons of calcium phosphate. Alicante produced 300 tons of ocher; and Badajoz and Coruña 160 and 39,500 tons respectively of tungsten ore, the latter's output as a byproduct from tin mining. A negligible quantity of sodium sulphate was mined in Zaragoza at La Sulfurica mine. Albacete produced 404 tons of tripoli.

The value of all these products in the year considered, with those of quarries which have not been mentioned, was 1,381,516,094 pesetas, the par value of a peseta being 19.3c. though at present it is worth about 14.5c. This represents an increase in value over 1923 of 262,-124,204 pesetas. The yield of the principal quarries was valued at 17,112,214 pesetas, against 15,511,797 in 1923. Statistics expressing value are worth but little for purposes of comparison, year by year. The figures given serve to show, however, that Spain has a mineral industry of importance and one that will furnish those attending the meeting at Madrid with many points of interest for study.

Rise of Lead and Tin Prices

LEAD AND TIN are the two important common metals that have, in the last year or two, sold far above their old levels. In the recent depression in metal prices, lead has suffered more than tin, the New York price having declined from 9¼c. last November to 7.85c., whereas tin has rather shown a tendency to advance in this interval and has, during the last month or two, kept well above 60c., even though the peak of 66c., reached in the middle of March, was not maintained. The increase in consumption of each of these metals has not been phenomenal in the last ten or fifteen years; only about one-third more of each is being used throughout the world than was consumed in 1913 and 1914. The great increase in price, therefore, is due to difficulty in expanding the supply to meet the reasonable increase in demand. Does the recent decline in lead prices, with comparative strength in tin, indicate that supplies of lead are now more than adequate, whereas tin prices are still insufficiently high to bring out the necessary production?

Current supplies of metallic tin are admittedly limited, and continued strength may be expected in the market in the next two or three months; but looking ahead over the next year or two, it is difficult to see any basis for much higher prices. Shipments from the Straits Settlements last year were the greatest in history, and the deposits are far from exhausted; and the next producer of importance, Bolivia, may be expected to increase its production for many years to come if prices continue favorable. Increasing production from other countries may also be expected at current prices. The present price of tin is five times what it was thirty years ago, and when such an advance as that has been recorded, it is safer to predict somewhat easier conditions in the future rather than further advances in price. Lead has already shown unsteadiness when the price neared 10c., and the same may reasonably be expected for tin at not far from current levels.

Today's Outstanding Metal Mine

PERHAPS the Sullivan mine of the Consolidated Mining & Smelting Co. of Canada is not the largest nor the most productive nor the most profitable mine in the world. Nevertheless, judged on current performance it is not easy to put one's finger on many that surpass it. In the accompanying table are shown some of the salient data in the record of the Consolidated company for 1925, together with annual rates of production at the moment based on the first quarter of 1926. Some of this production comes from custom ores and from shipments from other than "company" mines. Copper and gold in considerable quantity originate in the mines of the Granby company at Allenby, but so far as lead and zinc, at least, are concerned the figures virtually reflect the output of the Sullivan mine.

	Annual Rate, based on First Quarter 1926	Reported Figures for Year 1925
Lead output, lb.	245,000,000	236,000,000
Zinc output, lb.	114,000,000	98,000,000
Silver output, oz.	7,163,000	4,704,000
Gross earnings		$33,572,000
Net earnings		11,215,000

A few comparisons will emphasize the significance of these figures. The Cœur d'Alene district, with its famous Bunker Hill, Morning, Hecla, and Hercules, to mention only the larger mines, and second only to the Flat River district of Missouri, is credited with a production of 247,000,000 lb. of lead in 1925. Montana, with the Butte & Superior, Elm Orlu, Silver Dyke, and half a dozen of Anaconda's zinc producers, accounted for 102,500,000 lb. of zinc in 1925. And Nevada, far famed as a silver state, with the Tonopah Extension, Comstock Merger, Tonopah Belmont, Betty O'Neal, West End, and eight or ten others, contributed 7,000,000 oz. to the world's output of silver during 1925. For each of these metals the current production of the Sullivan mine is approximately equal to the total from the respective groups mentioned.

In 1925, Utah Copper, probably the most profitable of the Kennecott units, realized $11,103,000; Hollinger, candidate for the honor as the world's largest gold mine, reports an operating profit of $8,500,000; New Modderfontein, on the Rand, in South Africa, netted earnings equivalent to about $9,000,000, and Cerro de Pasco apparently earned $10,337,000, before charging depreciation. The United States Smelting, Refining & Mining Co., owners of the Real del Monte, the world's largest silver producer, does not report earnings separately, but they probably were not in excess of $8,000,000; and Anaconda certainly is not threatening to take any place in the sun with its copper-mining operations at Butte.

St. Joseph Lead and Chile Copper seem to have earned more in 1925 than the Consolidated Mining & Smelting Co. St. Joe operates a comparatively scattered group of properties in southeast Missouri that really embraces several separate mines. Moreover, its margin over the Consolidated is not large, and the latter is growing steadily. Earnings for 1924, $3,278,904, were more than tripled last year, and the figure for the first quarter of 1926 indicate the continued expansion of the scale of operations. The capacity of the concentrator is now being increased from 3,000 to 4,000 tons per day. St. Joe's profits depend almost entirely upon the price of lead, whereas zinc and silver are important sources of income for the British Columbian property. Mine production at Chile's Chuquicamata property, within reasonable limits, is governed by the number of steam shovels put to work. If open-cut operations are eliminated the Sullivan seems to have established a pretty tenable right to be called for the time being the world's foremost underground mine.

E. & M. J. at the Lead Mines

IN OUR ISSUE OF APRIL 3 an editorial described the prosperity of the lead industry, and gave a list of nine leading lead mines, with their earnings. This gave a clew to our ever-alert circulation department to investigate and see if *Engineering and Mining Journal-Press* goes to each of these mines. On searching the circulation lists they found exactly 110 separate subscribers who register as attached to these nine mines. This is sufficiently impressive; but on running over the lists the editors note the omission of several names, at least, of subscribers who belong to these mines, but who probably escaped the list because the addresses did not divulge the fact. Furthermore, it is true of all publications that a subscription means more than a reader: we are all thrifty, and a single subscription will often do for a group—even for a club or a library.

Taking it altogether, there is no doubt that *E. & M. J.* is read at the lead mines. The editors regard the *E. & M. J.* as in a professional way a co-operative institution. We depend on our subscribers not only for our audience, but for our contributors—and in a large sense, for setting us right as to our opinions and policies.

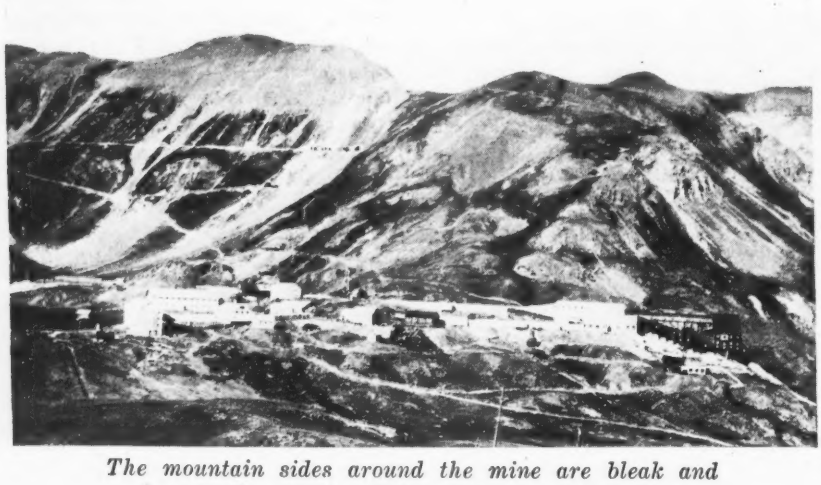
Town of Silverton, showing the Las Animas River and surrounding mountains

A spring scene in the San Juan—the road from Silverton to Eureka on May 1, 1925

The Caledonia mill was smashed up by a snowslide, the upper part of the mill being ruined by the accompanying air blast, though not touched by the snow

Surface plant at the Sunnyside mine, elevation 13,200 ft.

Views in the San Juan



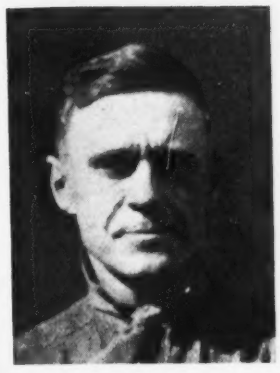
The mountain sides around the mine are bleak and barren, the elevation being well above timber line

Snowslides upset seven aërial tram towers in one winter

Selective Lead-Zinc Flotation at Sunnyside

Pioneer North American Plant to Employ This Process Is Representative as Well of Modern Practice—Use of Indicator Tables and Entire Absence of Regrinding Are of Interest

By Edward Hodges Robie
Assistant Editor



Bruce Marquand

SELECTIVE flotation of lead-zinc ores is now practiced in perhaps twenty or more plants in North America, so it has lost the novelty that it had two or three years ago. Practice cannot be said to be standardized, however, either as to the machines used, their arrangement, or the quality or quantity of reagents, for each ore presents a different problem, and varying smelter schedules make it advisable for a plant to make concentrates of certain grades, sometimes at the expense of the best recoveries that might otherwise be secured. The Sunnyside mill, at Eureka, Colo., was the first in North America to practice selective flotation. The ore is complex, consisting of zinc, lead, and iron sulphides, on which no profit could be made using the old processes. An immense amount of experimental work has been carried out there, though little has been published concerning it, as it was felt that until something approaching a standard practice had been developed only a partial story could be told. This has now been achieved, and the company has made a moderate operating profit in the last three years.

The Sunnyside Mining & Milling Co. is a subsidiary of the United States Smelting, Refining & Mining Co. The properties of the company are in that wonderful San Juan country of southwestern Colorado—one of the scenic spots of the world. The towering mountains of this region are well mineralized, though only a few of the known ore deposits are sufficiently large and rich to warrant working. Though the mountain sides about Silverton are dotted with prospect holes and old mine and mill buildings, only the Sunnyside, five miles up Las Animas River at Eureka, was in operation last fall at the time I visited the property. Perhaps exception should be made of a small operation a little further up, at the "forks," where three operators struck it rich last summer; they gave a "party" on Labor Day, which I overheard one respectable young lady forbidden to attend. Silverton, therefore, though a town of many houses, as the photograph shows, makes the least appearance of having a housing shortage of any town that I have seen in years. Eureka, however, the seat of the Sunnyside operations, is a bustling little place, even when covered with several feet of snow, as it is much of the year.

The mine is four miles from the mill and well above timber line, being at an elevation of 13,200 ft.—2½ miles. Here there is a big fault-fissure vein—one of the oldest veins worked in that region. Its width varies from 20 to 80 ft. Various levels down to a depth of 800 ft. are now being mined, over a length of about a mile. Three lenses or oreshoots occur in the vein as now worked. A blasting-chamber method of mining, similar to that used at the Walker mine, in California, is used. The ore is crushed at the surface and transported by a 16,000-ft. aërial tram to the mill, the foot of which is at an elevation of 10,000 ft., or 3,200 ft. below the mine.

The ore consists of a mixture of galena, sphalerite, and pyrite, in a quartz-rhodonite gangue. Some free gold is present but the silver probably occurs as the sulphide, AgS, in the lead, zinc, and iron sulphides. At the time of my visit, the mill feed was about as follows: Lead, 4.5 to 5 per cent; zinc, 6.5 to 7.5 per cent; iron, 3.5 to 4.5 per cent; and copper, 0.5 per cent.

The mill flow sheet on page 758 is self-explanatory. All ore is weighed by the usual weightometer before going to the mill bins. The tension on the conveyor belt is kept approximately constant by a weighted pulley operating in guides between two snub pulleys on the lower returning portion of the belt. This is necessary on account of the effect of varying tensions on the weighing device. The tonnage averages 750 a day.

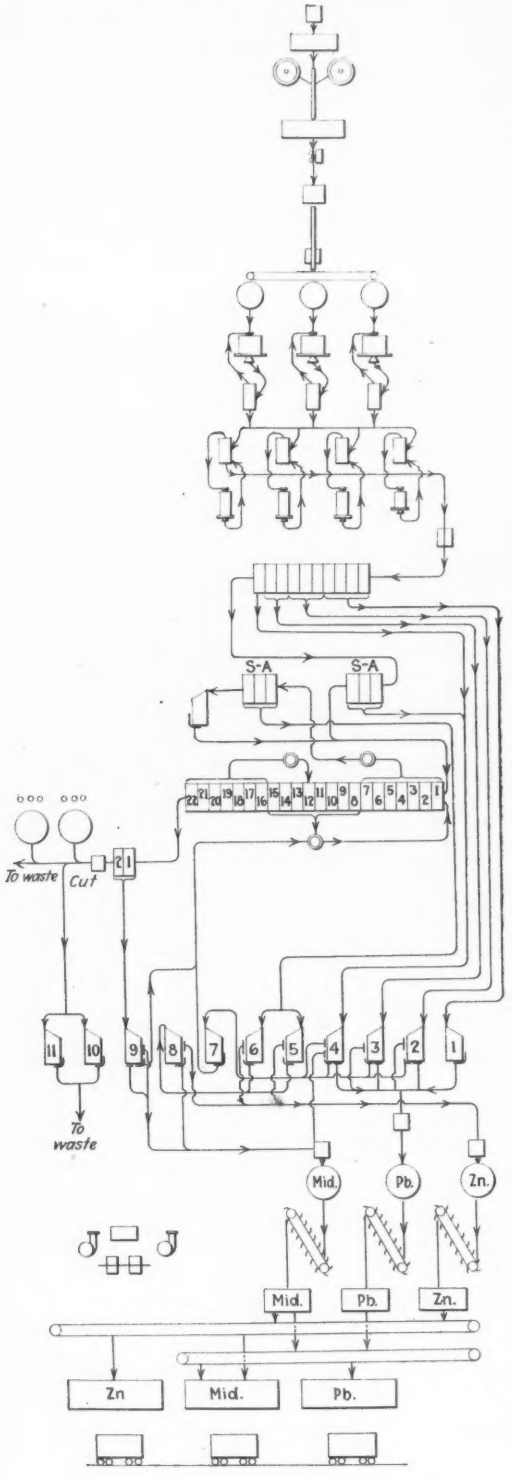
The ore fed to the three primary ball mills is somewhat larger than is usual practice, having had only one crushing in gyratories at the mine. It is supposed to be minus 2½ in., a size that is probably not so economical for crushing by ball mills as by rolls. A set of liners will grind from 40,000 to 50,000 tons of ore before requiring replacement, the old liners being thrown away, as the freight rates are higher than their scrap value. From fifteen to twenty 5-in. balls are added per eight-hour shift. A classifier is set in closed circuit with each mill, and flotation oils are added to the classifier return. Water, in about equal amounts, is added to the ball-mill feed and to the ball-mill discharge, the classifier overflow averaging about 55 per cent solids.

Following the ball mills, the pulp passes to the tube-mill circuit, consisting of three 5x14-ft. pebble mills and a 5x8-ft. ball mill. The large mills have white cast-iron liners of the El Oro type, which grind from 35,000 to 42 000 tons per lining. The small mill has a modified Komata liner of manganese steel, which will last for about 75,000 tons. It has been found economical to use mine rock rather than flint pebbles or steel balls for the grinding media, hard rhodonite being available, which is charged in irregular lumps, 6 to 8 in. thick. It contains sufficient valuable minerals to pay the cost of delivering it to the mill. About 1,800 lb. of this rock is used per day in each of the long mills, and in the short mill, 600 lb. per day plus about 120 lb. of cut drill steel scrap. Each of the secondary mills is in closed circuit

with a Dorr classifier, to which the pulp from the primary mills is fed. This pulp is combined and split to the tube classifiers, about 200 tons to each. As this contains about 30 per cent minus-200-mesh material, which, with some coarser material, overflows at once, the tube mills do not actually grind 200 tons each. The overflow from these tube-mill classifiers is maintained at about 26 per cent solids, all minus 65 mesh, and 60 per cent minus 200 mesh. This overflow forms the feed to the flotation department.

Let me just indicate roughly the plan of flotation treatment, and then I shall go into more detail regarding assays, kinds and amounts of reagents, and similar considerations. Details of the flotation machines used are given in the data accompanying the flow sheet on this page.

Three products are made, the 750 tons of mill feed giving 60 tons of lead concentrate, 65 tons of zinc concentrate, and 15 tons of a mixed lead-zinc concentrate (called middling). The lead is floated first in a ten-cell machine. Concentrates from the first four cells form a finished lead concentrate. Concentrates from the other



Flow sheet of the Sunnyside mill

Design and types of important mill equipment—Number, type, and rating

Mine crushers	2 Gates gyratories, No. 6K.
Aërial tram	16,000-ft. Trenton; 10 cu.ft. buckets; 45 tons per hour.
Apron feeder	Stephens-Adamson pan chain, 24 in. wide.
Cross conveyor	20-in. belt driven by G.E. motor, 440 volt, 10.5 amp., 7½ hp. Full-load speed, 875 r.p.m. Belt speed, 213 ft. per minute. Head-and-foot pulleys, 34 r.p.m.
Weightometer	Merrick.
Shuttle conveyor	S.A. 20-in. belt used when dumping into No. 1 or No. 3 bins. G.E. motor, 440 volt, 7 amp., 5 hp. full-load speed, 850 r.p.m. Head-and-foot pulleys, 42 r.p.m.
Main ore bins	3 cylindrical steel, built by Minneapolis Steel & Mchy. Co. On 12-sided concrete base, 12½ ft. deep. Bins 30 ft. diameter, 27 ft. deep. Total volume each bin, 24,984 cu.ft., or 1,300 tons. Effective capacity without shoveling considerably less, as have flat bottoms.
Ball-mill feeders	3 Stearns-Roger pan chain conveyors, 24-in. wide.
Primary mills	3 No. 86 Marcy mills, ¾-in. slots in grate bars. Manganese-steel liners and grate bars. Chrome steel (adamantine) 5-in. balls. Ball load, 10 tons. Driven by Westinghouse motor, 440 volt, 338 amp., 225 hp., 350 r.p.m. at full load. Direct-driven through herringbone gear mounted on discharge end of mill.
Classifiers	3 Dorr, model "D."
Classifiers	4 Dorr, heavy model "C."
Secondary mills	3 Dewco, 5x14 ft., each driven by 75-hp. Allis-Chalmers motor. 440 volts, 101 amperes, 490 r.p.m. under load. Belt drive to pulleys on shaft, with spur-gear drive on mills. 1 Dewco, 5x8 ft. ball mill, 26 r.p.m. Driven by 110-hp. G.E. motor, 440 volts, 138 amperes, 460 r.p.m.
Sampler	1 Rainbow automatic, for flotation feed.
Lead flotation	10 cells, Minerals Separation standard, 24-in. agitator, high-level type, equipped with froth restrictors. Gear driven.
Retreatment and zinc cleaner flotation	6 Minerals Separation sub-aëration type, 18-in. agitators, bottom drive, belt-driven.
Table	1 No. 6 Wilfley.
Zinc flotation	22 cells Minerals Separation, 24-in. agitators. All equipped with froth scrapers. Gear-driven. 1 Traylor 3-in. centrifugal pump for lifting froth from zinc rougher to zinc cleaner. Also 4 air lifts.
Tailing flotation	2 cells, M.S., 24-in. agitators.
Thickeners	2 Dorr, 40x12 ft., used only when short of fresh water.
Pumps	2 8x8-in. Deane triplex pumps.
Tables	11 No. 6 Wilfleys. 240 strokes per minute.
Samplers	3 Rainbow automatic.
Thickeners	1 lead concentrate thickener, Dorr, 24 ft. 6 in. x 7 ft.; redwood tank with concrete bottom paralleling rake path.
	1 zinc concentrate thickener, Dorr, 28x9 ft. Overflow to 14 ft. diam. x 10 ft. redwood tank to pond.
	1 middling thickener, 16x7 ft. Dorr. Overflow to pond.
Elevators	3 bucket elevators; lead, 8 in.; zinc, 10 in.; middling, 8 in.
Filters	2 Portland, 1 Oliver, drum type. Zinc, 12x9 ft.; lead, 14x4 ft.; middling, 12x3 ft. 6 in. One dry vacuum pump, Ingersoll-Rand, class ERI, 18x6 in.; served by two 2-in. centrifugal pumps.
Conveyors	2 belts, each 12 in. wide.
Bins	3 steel; lead, 400 tons; zinc, 600 tons; middling, 100 tons.
Cars	Narrow-gage box cars. Electrically driven box-car loader, made by Stephens-Adamson.
Scales	One 100-ton Howe scale.
Compressors	One large Blaisdell, 18x12x12 in. One small Ingersoll-Rand, 15x12x9 in.
Motors	General Electric, Westinghouse, Allis-Chalmers, and old Bullocks.
Buildings	Machine, blacksmith, and carpenter shops, boiler plant, and assay office.

The mill, and the town of Eureka

Above — The tram carries most everything from the town to the mine, including men, and, as here, mine cars and supplies

This is a 1,600-ft. span of the aërial tram, the longest of any of the spans. The entire system is 16,000 ft. long, with a net drop in altitude of 3,200 ft., and crossing numerous gullies

Five locomotives were required here to buck the snow

six cells are tabled, the table concentrates, in turn, forming a finished lead concentrate, but the middlings and tailings being subject to re-treatment in some instances, as shown on the flow sheet.

The tailings from this first group of lead cells all pass to a group of three sub-aëration cells, the concentrates from which are tabled to give a finished lead concentrate, middling, and re-treatment products. Tailings from the group of three secondary lead cells form the entire primary feed to the zinc flotation cells. All zinc concentrates are re-treated at least once by flotation, and all final zinc flotation concentrates are tabled, as is done also with lead concentrates. Tables, therefore, form an important part of the flow sheet. They are fed in all but three instances with flotation concentrates, which they serve to clean, the table concentrate in general carrying the lead, and the table tailing carrying the zinc. The system of re-treatment by flotation and tabling is complex, but a close study of the flow sheet will make clear the function of each flotation cell and table.

Three Dorr thickeners are employed for thickening the lead concentrates, zinc concentrates, and middlings. The lead thickener discharges at 60 to 75 per cent solids, the overflow going to settling ponds which are cleaned every year. Lime is added to the middling thickener to settle the slime; the underflow runs from 50 to 60 per cent solids. The underflow from each thickener is elevated to a Portland filter, from which the filter cake is transferred by belt conveyor to the shipping bins. Three products are handled with two belts, as shown on the flow sheet, though not all at once, of course. Both air agitation and mechanical agitation are used in the filters. The lead filter cake contains 6 to 8 per cent moisture; the zinc 6 to 7; and the middling, about 5½ per cent. The concentrates are discharged from the bins through chutes to a box-car loader, the installation of which has cut loading costs materially. The lead concentrate and the middling, which is really a mixed concentrate, are shipped to the Durango smelter of the A. S. & R., the zinc to the U. S. Zinc Co.'s smelter at Henryetta, Okla.

The following table shows analyses of various products and recoveries over a sufficient length of time to be representative:

Average Analyses

	Oz. per Ton		Per Cent		
	Au	Ag	Pb	Cu	Zn
Mill feed	0.072	3.66	4.8	0.49	7.2
Lead concentrate	0.54	25.0	46.7	2.84	12.9
Zinc concentrate	0.08	6.8	5.7	1.17	53.8
Middling	0.34	16.3	15.4	3.2	26.5
Tailing	0.02	1.06	0.63	0.13	1.1

In addition, the iron content is roughly as follows: feed, 4; lead concentrate, 7; zinc concentrate, 4; and middling, 18. The lead concentrate contains about 6 per cent of "insoluble," and the zinc concentrate, 2 or 3 per cent.

Recoveries

	Au	Ag	Pb	Cu	Zn
Lead concentrate	54.8	49.5	70.9	41.7	12.9
Zinc concentrate	9.9	16.3	10.6	21.0	66.0
Middling	11.1	10.6	7.6	15.4	8.7
Tailing (by difference)	24.2	23.6	10.9	21.9	12.4

Generally speaking, the aim is to get a high recovery in the lead concentrate and middling, and high grade in the zinc concentrate.

How the Galena is Floated

For floating the lead, a mixture of the following composition is added to the primary ball mills:

One barrel coal tar (Public Service Corporation, Denver).

One-half barrel hardwood creosote (Cleveland Cliffs No. 2).

One-fourth barrel crude napthalene (Public Service Corporation, Denver).

Also, to retard flotation of zinc, sodium sulphite is added at this point, this procedure being patented and under the control of the General Engineering Co. Sodium sulphite, if added in sufficient quantity, inhibits the flotation of everything. Too much of the tar-creosote-naphthalene mixture must not be added at the ball mills or a dirty froth will result. To the agitating compartment of the first lead machine is added more of this mixture, plus the following: Soda ash (58 per cent); pine oil (Hercules steam-distilled); potassium xanthate; and sodium silicate (Philadelphia Quartz Co.'s "N" brand). The pine oil, of course, promotes frothing. The sodium silicate aids in giving a brittle, low-insoluble froth in both the lead and zinc circuits. It is added only in the lead circuit, but is carried forward into the zinc circuit with the same effect. The total amounts of reagents added to the lead circuit per ton of mill feed are as follows:

Reagents Added to Lead Circuit

	Pounds per Ton of Ore		Pounds per Ton of Ore
Coal tar	0.15	Sodium sulphite (crystals)	0.25
Hardwood creosote	0.05	Sodium silicate	0.75
Soda ash (58 per cent)	1.00	Naphthalene	trace
Xanthate	0.05		

Fresh water is used in the mill circuit, as the reagents used in floating the zinc make the water from the settling ponds unadaptable for lead flotation. Soda ash is used instead of lime, because it does not raise so much iron, and the pyrite is very readily floated when finely ground. Caustic soda gives too stiff and heavy a froth. The xanthate added is an aid in speeding up the flotation of lead.

Galena floats the most readily of any of the minerals present; then, in order, sphalerite, and pyrite. Free gold in a finely ground pulp floats less readily than galena but more readily than sphalerite. At Sunnyside, lead flotation is carried further than would perhaps be desirable elsewhere, to get the maximum amount of gold into the lead concentrate.

The results of one test on the ten lead cells may be given in brief form, as they are interesting. Gold in the concentrate from cell No. 1 was 0.60 oz., increasing to 0.96 oz. at cell No. 6, and down to 0.84 at cell No. 10. Silver was 23 oz. in cell No. 1, increasing to 26.2 oz. at cell No. 5, and decreasing to 22.5 oz. at No. 10. Lead was highest in the concentrate from No. 1 cell, 53.5 per cent, decreasing to 25.8 per cent in No. 10. Copper was about 4.2 per cent at every cell. The percentage of zinc increased from 9.3 in the concentrate from No. 1 to 23.8 in No. 10. Iron increased from 6.4 in No. 1 to 10.8 in No. 10; and the "insoluble" increased about the same—5 to 9. The point of all this is that the operators have no particular control over the gold, silver, and copper, and are forced to float a rather zincky lead product to get the gold, silver, and copper into the lead concentrate. The conditions under which these three metals float are also favorable to zinc.

So much for the lead flotation department.

To the first cell of the zinc flotation roughers is added: copper sulphate; xanthate (solution of 80 lb. in a barrel of water); and an oil mixture containing

equal parts of hardwood creosote, coal tar, and pine oil. More copper sulphate is added at the first of the three sub-aëration zinc cleaner cells treating the concentrate from the seven zinc rougher cells. The amount of copper sulphate added varies directly with the amount of zinc in the ore. The combination of copper sulphate and xanthate is far superior to anything else that has been used at this plant for raising zinc.

The amounts of the reagents used, in pounds per ton of mill feed, are as follows, though, as just stated, the copper sulphate is variable:

	Pounds per Ton		Pounds per Ton
Coal tar	0.08	Copper sulphate (crystals)	1.5
Hardwood creosote	0.04	Xanthate	0.18
Pine oil	0.05		

The analyses and recoveries in the zinc concentrate have already been given.

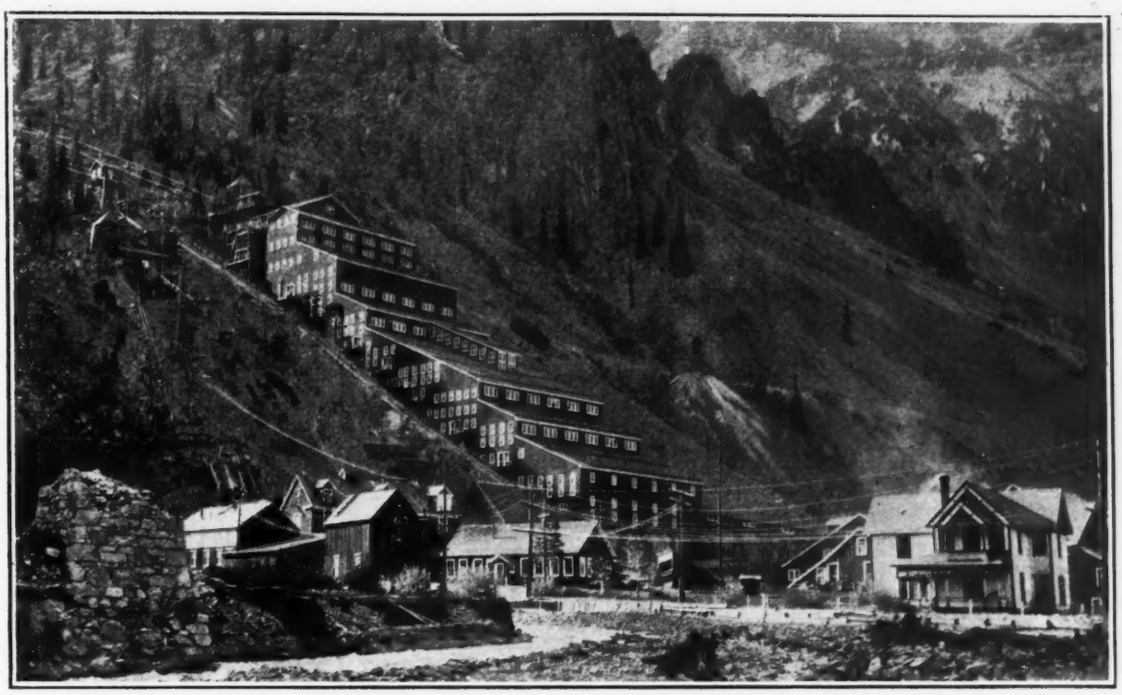
It may be of interest to give the relative costs in the lead and zinc flotation departments:

	Cents per Ton	
	Lead Flotation	Zinc Flotation
Labor (operating and repair)	3	3
Reagents	9	17
Other supplies	1	..
Power	2	4
Total	15	24

Experience with the Minerals Separation machines at the Sunnyside mill has been very satisfactory, and it is felt there that they are the best of the mechanically agitated type for the purposes for which they are used in this plant. The old type sub-aëration machines are not so favorably regarded, and no porous-bottom cell is considered so well adapted for selective work as those with mechanical agitation.

The Function of the Tables

Now, a word as to the use of the tables, over which all flotation concentrates pass. Referring to the flow sheet, the single table over which the tailing from the three zinc cleaner cells passes is purely an indicator, its entire product going back to the zinc roughers. This table should get a lot of iron. If not, more copper sulphate should be added. If too much zinc appears on this table, the copper sulphate should be cut down. Further down the flow sheet, a group of eleven tables is noted. Table No. 1 is an indicator for zinc and iron in the lead concentrate from the first four cells. If too much is visible, an adjustment of the oils or sodium silicate is indicated. If too much zinc is seen, more sodium sulphite is advisable, since this depresses the flotation of zinc. No separation is attempted on this table, the whole product being finished lead concentrate.



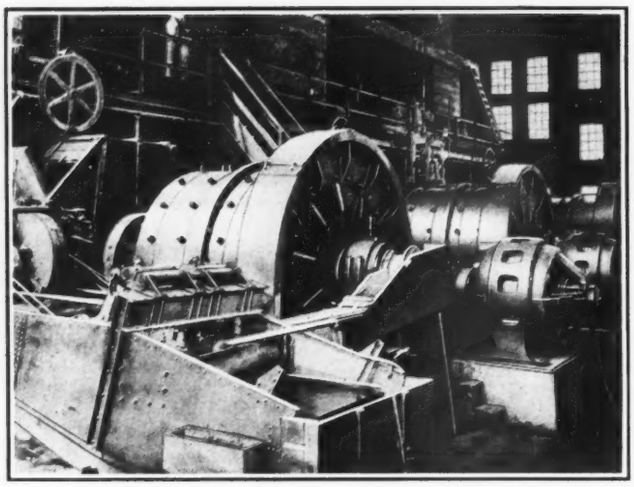
The Sunnyside mill at Eureka. There was no difficulty in this country in obtaining a gravity flow; rather must the mill be anchored to keep it from sliding off the mountain

Tables 2, 3 and 4 also act as indicators, but to a less extent. They also serve to make middling and tailing products, which are either shipped as middlings or go back to the lead cells for re-treatment.

Tables 5 and 6 are fed with the zinc cleaner concentrate, which emerges from these tables largely as a slime and goes direct to the dewatering department for shipment. These tables are watched closely for lead and iron. If there is too much lead present, more oil should be added to the lead circuit, or the lead machines should be adjusted so that more lead is pulled, and thus prevent it from getting into the zinc circuit. If too much iron is present, a reduction in the amount of copper sulphate is indicated, or it may be advisable to cut down the xanthate or oils. Absence of copper sulphate results in a dirty froth—high in iron and particularly in "insoluble." The right amount of copper sulphate gives a clean zinc concentrate; the addition of more will increase the iron content but will not increase the "insoluble."

Table No. 8 serves to split a return to the zinc circuit and a middling shipping product. It also serves somewhat as an indicator for iron. Table No. 9 is for splitting the concentrate from the two scavenger flotation cells into the most economical channels.

Tables 10 and 11 are purely indicators, taking a cut from the mill tailing. If lead or zinc appears here it



The ball mills, with their motors and classifiers

is not recovered, but steps are taken to prevent its coming. This, of course, rarely happens, as imperfections in operation are usually noticed before any marked loss occurs in the tailing.

The Sunnyside mill represents perhaps the highest development of indicator tables that can be found anywhere. Most of the tables also serve a double purpose in aiding the cleaning of concentrates and splitting them into one or more shipping products. Another interesting point about this mill is that no regrinding is practiced. The ore is ground finer than usual—60 per cent minus 200 mesh—before any method of concentration is applied, and no further grinding, which complicates a selective flotation flow sheet considerably, is necessary. The opportunity to market a mixed concentrate to good advantage is particularly appreciated from this standpoint.

To run the mill, twenty-five man-shifts per day are required. On each of the three shifts there is a shift boss, one man for the ball mills, one for the tube mills, one for lead flotation, one for zinc flotation, and two men in the filter plant. There is also one conveyor man on each of two shifts, and there are two repair men on one shift.

The Sunnyside company, as already noted, is a subsidiary of the U. S. Smelting, Refining & Mining Co., which has just completed another selective flotation plant at Midvale, Utah. This new mill follows the general principles of Sunnyside practice except that the ore is ground fairly fine in rolls, and then to flotation size in ball mills.

To Bruce Marquand, formerly mill superintendent and now general manager of the Sunnyside property, is due great credit for his pioneer work in selective flotation, without which this mine could not have been made an economic success. For his hospitality and that of his assistant, Mr. Reynolds, during my visit I have already expressed my appreciation directly, but I feel that readers of this article will also appreciate his broad-minded spirit of co-operation and that of the other executive officials of the company in releasing these intimate details of plant operation.

A Power-Supply System in the San Juan

Smuggler Union Uses Same Water Twice, First to Operate Generators at Bridal Veil Falls, Then to Run Pelton Wheel at Pandora Mills

AN IMPORTANT feature of the operations of the Smuggler Union Mining Co., at Telluride, Colo., is the water supply. This is obtained from a series of lakes, which are situated at an altitude of 12,300 ft. These lakes or reservoirs, some of which are of natural origin while others have been improved, form a storage capacity of 6,509 acre-feet. In this region the annual run-out season usually lasts about five months, during which period the reservoirs are filled to capacity by a system of supply pipe lines, totaling 31,000 ft. and varying in diameter from 10 to 16 in.

Located in almost inaccessible places, spanning canyons, and clinging to the cliffs, this system of pipe lines was built and has been maintained in the face of great difficulties. Originally installed to supply power and water for mining and milling purposes, it is still functioning in this capacity in a profitable manner, since the need of water for operation is great enough to outweigh the disability of the power plants during a period of short water.

During June, 1925, the total demand for the mines and mills was 2,284 hp. Of this the Smuggler Union plants furnished 1,212 hp. and the remainder was supplied by the local power company from its plants situated at Ames and Tacoma. The Smuggler plants operate in parallel with those of the local power company. The flexibility of the interconnection of power lines is obvious, and it helps make possible uninterrupted service, which is a matter of importance in the mining company's operations.

The Smuggler Union company develops power at two points—namely, by the fall from Blue Lake through a pipe line to the falls, where about half the supply is generated electrically. Thence the water is conducted by pipe line to the mill, where power is developed mechanically by Pelton wheel.

During the run-out season the Bridal Veil plant is supplied by the normal run-out, which is taken into the system 2,000 ft. above the plant and is conveyed to the plant through a 12-in. lap-welded pipe 11,000 ft. long. At the plant the water is used to drive one 500-hp. 2,300-volt a.c. generator. The electric current is then stepped up to 11,000 volts, and is fed directly into the system of power lines. Thence the water is carried through 6,000 ft. of 16-in. diameter lap-welded pipe to the Pandora mills 1,400 ft. below the Bridal Veil plant, where a second plant is situated. Here after its power possibilities are exhausted it is used for milling and all other purposes. Thus a gallon of water is made to do double duty.

During the winter months the Bridal Veil plant is supplied from the Blue Lake reservoir, the water being pumped from the lake by a system of pumps installed in boat houses which float on the surface of the lake. The discharge line from the pumps floats on barrels. As the level of the lake falls the boat houses follow, any inequality in the discharge line being compensated for by a system of expansion joints that are placed in the pipe line.

Platinum in the Transvaal and Elsewhere—II

By A. W. Newberry and James F. Kemp

Recent Platinum Developments in the Transvaal*

The Potgietersrust District

By A. W. Newberry
Mining Engineer, 2 Rector St., New York

THE basic rocks of the Bushveld complex disappear under Bushveld amygdaloid of the Karroo system at the northwest end of the Lydenburg district. They are found again 15 miles south of Potgietersrust, and from this point northward they form the floor of the Magalakwin valley for a distance of 40 miles, outcropping over a width of 3 to 7 miles. At a point roughly 25 miles northwest of Potgietersrust they swing away from the river and extend another 30 miles a little east of north until they are again covered at a point about 100 miles south of the Limpopo.

On some of the old Boer maps of this region, the Magalakwin is called the "Nyl." The explanation is that Piet Potgieter and his band of vortrekkers had been in the wilderness so long and had endured so many hardships on their journey overland from the Cape of Good Hope that they believed they had reached the central part of Africa and found the source of the Nile. A glance at the map of Africa will show how far out their calculations were.

Topographically the Potgietersrust area is much less rugged than the Lydenburg district. Elevations range from 3,450 ft. in the valley of the Magalakwin to about 6,000 ft. The Magalakwin is a sluggish stream with banks which have a tendency to be swampy. Its average fall is only 6 ft. to the mile. The valley carved by this stream is the outstanding topographic feature of the area. Along the western edge of it with its base close to the river rises the Macapansberg, the steep granite range in which the Zaaiplaats tin mine is situated. The valley itself is narrowest a little south of Potgietersrust, but even here it is nearly 4 miles wide. North of Potgietersrust it is from 5 to 8 miles wide. Along the eastern edge is a series of ridges which attains its greatest height—about 2,000 ft. above the plain—in the southern part of the area.

A few isolated ridges and kopjes rising to a maximum height of about 400 ft. break the otherwise even surface of the plain. The slopes are covered with thorn scrub, as in the vicinity of Lydenburg. A fair percentage of the valley is under cultivation, and there are several native kraals scattered about it. As the mineralized area recedes from the river in the neighborhood of farms Drenthe No. 982 and Witrivier No. 282, the surface becomes rolling.

The dominant variety of rock in this area is a spotted, or mottled, gray norite. Outcrops are frequent, owing to the scantiness of the soil. The rocks are pseudobedded as in the Lydenburg district, and dip in a general westerly direction, the angle of dip increasing with the distance from the river, except on Drenthe and Witrivier, where rather flat dips were observed.

The Dolomite series of the Transvaal system projects into farm Vaalkop No. 1439 from the southeast, and an outlier of it extends northwest to about the middle of Zwartfontein, No. 1174. The Dolomite series forms the footwall of the Bushveld complex only as far north as the south boundary of Vaalkop. Where the dolomite crosses the sloot, near the northeastern boundary of Zandsloot, it strikes N. 58 deg. W. and dips 32 deg. S.W. Northeast of the dolomite the Older granite of the Swaziland system outcrops over a wide area. From the middle of Zwartfontein northward to Witrivier, the Dolomite series is lacking and the Older granite forms

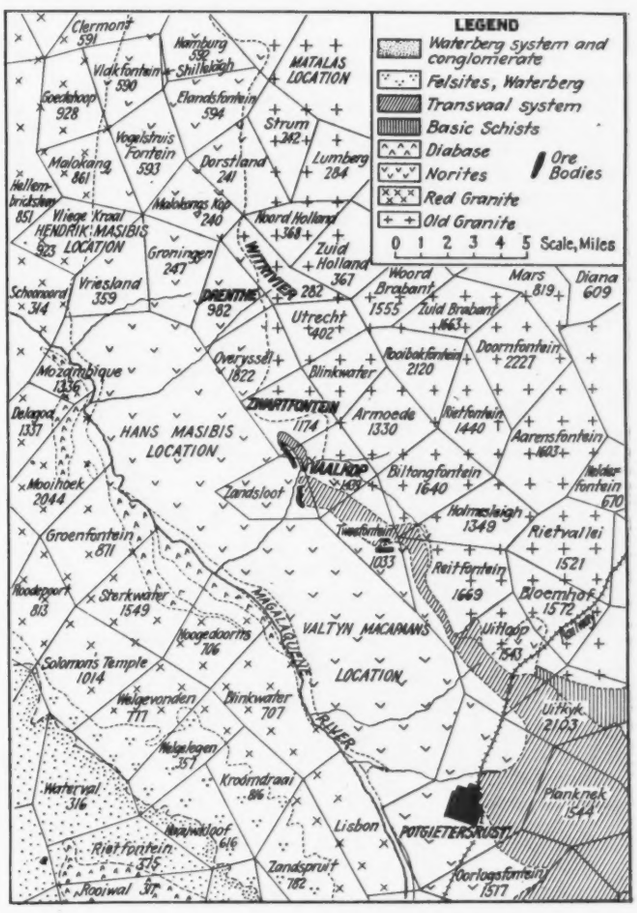
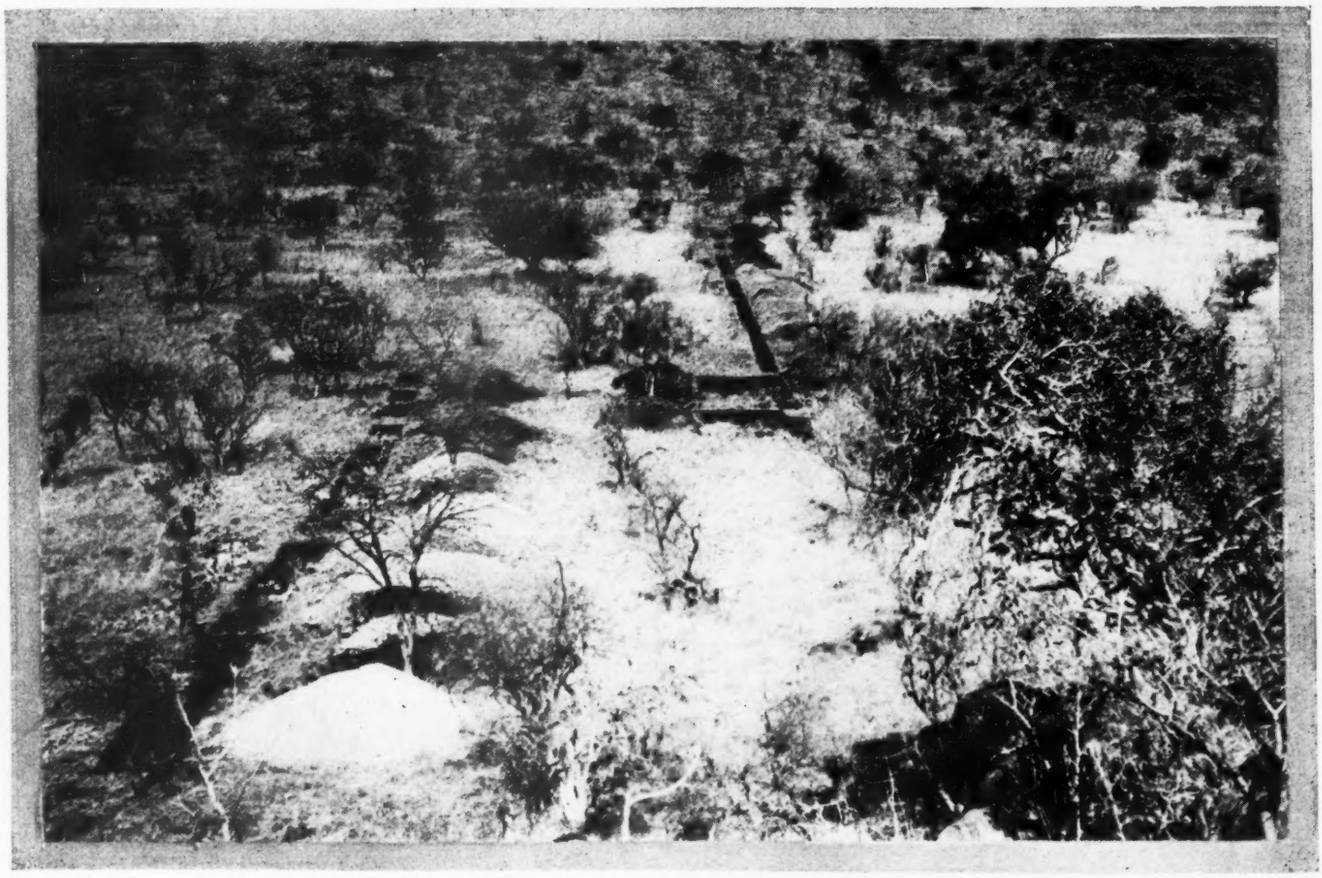


Fig. 5—Geological map of the Potgietersrust platinum field, Transvaal

*The first instalment of Mr. Newberry's paper appeared in the May 1 issue of *Engineering and Mining Journal-Press*.

Prospect pit on Tweefontein



Trenching on Farm Grasvally, Potgietersrust district, in effort to locate reef

the footwall of the Bushveld complex. Close to this footwall there is marked differentiation, but in general the more basic varieties favor this horizon.

Overlying the dolomite along the eastern edge of Zandsloot and extending over into Vaalkop, this ultrabasic phase is exhibited in a mass of coarse-grained pyroxenite outcropping over an area about a mile long by 2,000 ft. wide at the center. Crystals of diallage up to an inch or more in length are of common occurrence in this body. The contact between the pyroxenite and the overlying norite dips from 45 to 70 deg., the average dip observed being about 60 deg. There is some evidence that the pyroxenite is later than the norite, but the former rock maintains its coarsely crystalline texture right up to the contact, which argues against its being an intrusive. A narrow dike of pegmatite was observed in the pyroxenite on Zandsloot, closely paralleling the norite contact for a distance of several hundred feet.

Type of Deposit Intermediate Between Those of Lydenburg

No outcrops of dunite similar to the pipe-like occurrences of that rock in the Lydenburg district have been found in the area under discussion. An outcrop of pyroxenite more or less circular in form on farm Witrivier is the nearest counterpart. The pyroxenite bodies of the Potgietersrust district, in that they are ultrabasic segregations of a moderately basic magma and occur close to the footwall of the Bushveld complex, have rather more in common with the dunite horizon of the Lydenburg district than with the so-called Main Reef horizon. The class of ore deposit to be expected in the region here described would therefore be wider and less continuous on the strike than the Lydenburg Main Reef occurrence. In short, a type of deposit intermediate between the two types met with in the Lydenburg district in respect to width and continuity, and possibly also in respect to angle of dip and metallic content, is the type that should by analogy predominate.

Along the contact on farm Zandsloot for a distance of at least 2,300 ft., the pyroxenite has been sheared and impregnated with sulphides of iron, copper, and nickel over a horizontal width of 100 to 150 ft. The metallic content appears to diminish as the distance from the norite increases. Oxidation doubtless extends to a depth of more than 50 ft., but occasional unaltered boulder-like masses showing pyrite and other sulphides are met with in the oxidized zone. Platinum accompanies the base metals and is distributed with a fair degree of uniformity throughout the sheared pyroxenite for a horizontal distance of 40 to 100 ft. from the contact. The platinoids are very finely divided, but they may as a rule be detected in panning when present in excess of 1 dwt. to the ton.

At five places along the eastern boundary of the norites (see geological map, Fig. 5) distinct embayments of the Bushveld formation into the older rocks may be noted. Of these I have studied only two: the most southerly, on farm Orlogsfontein, No. 1517, and the middle one, on farm Tweefontein, No. 1033. The former appears to be a simple embayment without apparent deformation of the intrusive, although the sediments show a broad synclinal fold. The latter, in plan, is a distinct, letter S bend, which appears to have affected both the intrusive and the sediments to a marked degree. I shall present my geological data regarding Tweefontein in some detail.

The Geology at Tweefontein

The Pretoria series is lacking, and the topmost member of the Dolomite series, which underlies the Bushveld complex, is a belt of magnetite-quartzite, locally known as banded ironstone, about 400 ft. thick and extending, apparently without a break, for 7 miles. The rock is a laminated quartzite with bands of magnetite up to an inch or more in thickness, the magnetite constituting about one-fourth of the mass. The strike of

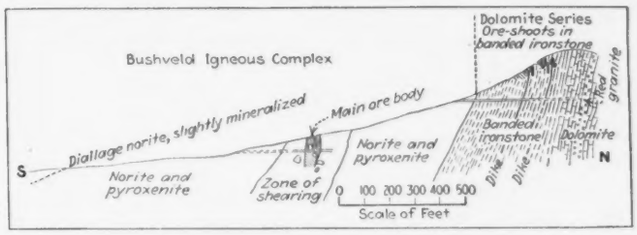


Fig. 6—General section on Farm Tweefontein (No. 1033), looking west

the banding is in general parallel with the trend of the hills. The dip, which varies locally between wide limits, is for the most part from vertical to 60 deg. southwest. The ironstones have been intruded along planes parallel with the banding, by basic dikes up to 4 ft. in thickness. The dike rock is in all cases completely altered to a soft micaceous material. Between the ironstone and the norite proper on the central part of the farm there is a zone of shearing up to 300 ft. in width. A high degree of alteration prevails here, with the deposition of iron and manganese minerals and a little quartz.

Platinum Ore Along Shear Zone

Bodies of platiniferous ore up to 40 ft. in width occur along this zone of shearing. A composite sample from this locality showed:

	Per Cent
Cu	0.55
Ni	0.20
Platinoids dwt. per ton of 2,000 lb.	4.1

Oxidation extends to a depth of at least 60 ft. Insufficient work has been done to prove the shape of the oreshoots. So far they appear most irregular in form. The platinoids are very finely divided.

At several places within this zone, fragments of light-brown hornfels up to 6 ft. across have been found. The most interesting inclusions, however, are masses of a dense, dark-gray, rock exhibiting marked conchoidal fracture. Some of these included masses appear to be at least 25 ft. across, and the larger ones have been extensively sheared. They carry an appreciable amount of platinoids, more than 3 dwt. to the ton in some instances, but the metal may have been introduced during or subsequent to the shearing. A thin section, examined under the microscope, proved the rock to be a quartzite containing abundant small grains of pyroxene, partially altered to serpentine, and a comparatively small amount of magnetite. Such a rock could have been derived only from the simultaneous disintegration of two distinct rock types, one of them acid and the other basic. The banded ironstone, which forms the

Collar of shaft No. 6, Farm Zandsloot. Dr. Merensky standing by windlass with back to camera

backbone of the most prominent ridge in the vicinity, could easily be the source of the quartz and magnetite, but the pyroxene is not so easy to account for, because of the dearth of basic intrusions in formations older than the Bushveld complex. Extensive sills of diabase and allied rocks are common in the Pretoria series of the Lydenburg district, but this series is not found on Tweefontein. The highly altered basic dikes which intrude the banded ironstone could well have supplied the pyroxene except for one important fact. Some of them are platiniferous to a marked degree. This leads to the inference that they are related to the Bushveld formation, which, as far as we know, is the source of the platinoid metals in the eastern Transvaal. How, then, could these dikes be the source of the ferro-magnesian minerals which were first embodied in a sandstone, which sandstone was surrounded by the Bushveld magma and through that agency metamorphosed to a compact quartzite?

Red Granite Intrusive in Dolomite Series

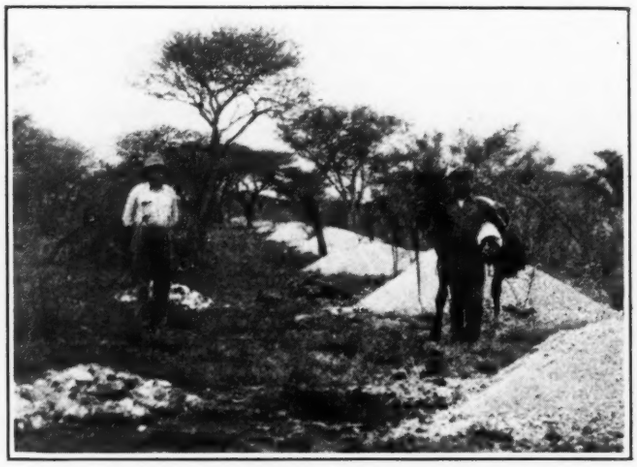
One other notable fact should be mentioned in regard to Tweefontein. The red granite, a late phase of the igneous activity which produced the Bushveld complex, is found intrusive into the Dolomite series. This points to a possible introduction of the platinoid metals into the basic rocks while these basic rocks were being crushed and sheared or later.

That platinoids were introduced into crushed and sheared portions of the banded ironstone is a demonstrated fact. About 900 ft. north of the above-mentioned zone of shearing and at least 200 ft. from the nearest igneous outcrop is an oreshoot, at least 12 by 30 ft. in plan, averaging more than 6 dwt. platinoids to the ton at a depth of about 25 ft. In this locality there are also a number of smaller oreshoots, some of which show very high platinoid content, individual samples over widths of 4 ft. yielding more than 3 oz. platinoids to the ton.

The banded ironstone has been subjected over limited areas to considerable crushing, and both it and the altered dikes above referred to show iron and copper stains. In one of these mineralized localities, the banded ironstone has been tilted through an arc of 90 deg. In another there is a boulder-shaped mass about 3 by 5 ft. in cross-section, at least a quarter of which is made up of metallic sulphides. I was able to identify arsenopyrite and chalcopyrite, and the analysis of the sulphides yielded over 2 per cent of nickel. My sample across the mass gave 13.1 dwt. platinoids. According to a cable I received in February, 1926, well-formed crystals of sperrylite have been found in this neighborhood. These occurrences are now being investigated at a depth of 150 ft. by means of an adit 500 ft. long.

Three Mineralized Horizons on Tweefontein

I have mentioned two distinct ore occurrences on Tweefontein. There is a third mineralized horizon on this farm, situated about 1,000 ft. south of the main zone of shearing above referred to. This at the time of my visit had been opened at only two points less than 100 yd. apart. It has the appearance of a reef of diallage norite about 5 ft. wide, and shows a small amount of copper and iron staining. The reef strikes east and west and dips about 22 deg. south. The triclinic pyroxenes are not as well developed as on Zandsloot or even



Test-pitting on Rooipoort, south of Potgietersrust, where reef has recently been located

in the Lydenburg district, and mineralization appears slight. Assays run in the neighborhood of 1 dwt. platinoids to the ton.

The southern half of the Potgietersrust area shows a large amount of serpentinization. Bands of dark, greenish-gray serpentine up to 500 yd. horizontal width may be traced for at least two miles on the Potgietersrust town lands and for even greater distances on Volspruit No. 726, Zoetveld No. 728, and Grasvally, which borders Zoetveld No. 728 on the northeast. On Volspruit a well-defined lens of ore averaging more than 4 dwt. platinoids has been shown to occur in serpentine in close proximity to a slightly amygdaloidal, felsitic rock. Some of the felsitic float in this locality, which shows oxides of iron and manganese, has been found to carry an appreciable amount of platinoids. The felsite occurs in an area mapped by the government as Bushveld amygdaloid, but its appearance is suggestive of the acid lavas of the Waterberg system.

Considered broadly, the Potgietersrust area is a region of oreshoots rather than one traversed by a persistent and more or less uniform platiniferous horizon. Certain of these shoots are of enormous size. The largest, exposed on farms Zandsloot, Vaalkop and Zwartfontein, is reported to be 12,000 ft. long and up to 35 ft. between walls.

The average grade along 2,300 ft. at the south end is 3 dwt. platinoids to the ton over a width of 27 ft. No figures are available for the middle section, but Dr. Hans Merensky, in his report on this area issued in

November, 1925, states that in two trenches and one shaft near the north end of the orebody the following results were obtained:

Trench No. 1, Vaalkop, 7.07 dwt. over 40 ft. (horizontal width).
Trench No. 1, Zwartfontein, 6.5 dwt. over 28 ft. (horizontal width).
Shaft No. 1, Vaalkop, 11.8 dwt. at depth of 10 ft. (width not given).

Other Districts

The Waterberg district has already been referred to. It is fully described in a government bulletin by Wagner.[13]

The Pretoria district is traversed from east to west by a belt of basic and ultrabasic rocks, outcropping over a maximum north-south width of 8 miles. A platiniferous horizon has been proved on farm Elandsfontein and traced nearly the length of the farm, a distance of more than 3 miles. I visited the occurrence in September, 1925, at which time exploratory work was only just getting under way. What I saw was a band of dark brownish green diallage norite from 15 to 25 ft. wide striking N. 75 W. and dipping 12 to 20 deg. northeast. Samples taken the full width of the outcrop showed a little more than 1 dwt. platinoids per ton. There appeared to be a slight concentration of copper and iron in the neighborhood of the hanging wall, and

Discovery trench on Elandsfontein, Pretoria district

it is reasonable to suppose that the platinoid content is also higher in this section of the reef.

The same belt of basic rock extends westward into the Rustenburg district, widening to about 15 miles near the town of Rustenburg, at which point it makes a turn to the northwest. Prof. A. L. Hall, of the S. A. Geological Survey, stated that a reef of diallage norite, similar in appearance to the Merensky reef of the Lydenburg district, had been found on farm Boschpoort, No. 57. I did not visit the locality.

Metallurgical Difficulties

There is very little precedent for the extraction of platinum from its ores, nearly all the world's supply having come from placers, so the metallurgists of the Transvaal had to begin at the beginning. Flotation has been found to save 70 to 80 per cent of the platinoids in a typical Lydenburg sulphide ore, and flotation in conjunction with gravity methods of concentration has shown a still higher recovery. The defect of all such methods is the low platinoid content of the concentrate. About 5 oz. seems to be the economic limit, and a concentrate of this grade may carry 6 to 10 per cent of copper and 1 to 3 per cent of nickel, in addition to large amounts of iron and sulphur. The refining of such a concentrate presents difficulties. Encouraging results have been reported from some modification of the amalgamation process, by which the platinoids are recovered in the metallic state. No details on the working of this process have been given out up to the present time.

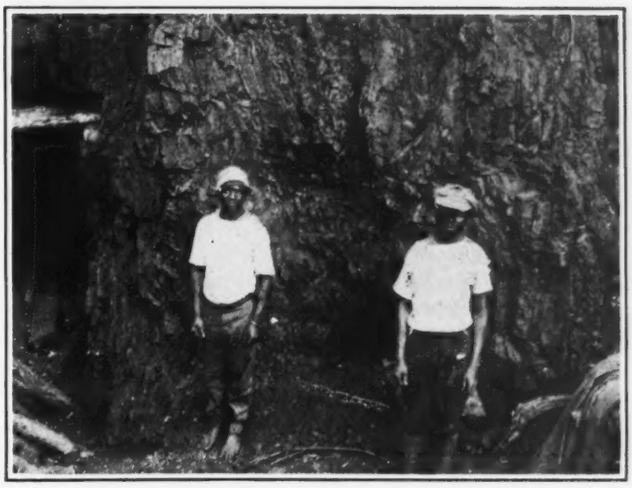
Two pilot mills, treating 20 to 30 tons of ore per day, went into operation in January of this year, and two more of 50 tons daily capacity each were expected to be running by April. Others are under construction. One of the mills now in operation is treating the siliceous ore of the Waterberg district. Experimental work on this ore indicated that a 60 per cent recovery could be made by gravity concentration and that a high recovery of the finely divided platinoids in the tailings could be obtained by a short chlorination treatment.

Economics—The Prospective Supply

How much platinum can the Transvaal turn out? What is going to be the cost of producing an ounce of platinum from Transvaal ores? And what will be the market price of the metal once the mines of the Transvaal have begun to turn it out in quantity?

To the first of these questions I shall reply, "As much as the world can consume." Pre-war world consumption was in the neighborhood of 300,000 oz. annually. Six plants treating 1,000 tons of 3.5 dwt. ore per day would supply this amount. The other two questions are not so easy.

Mining costs in the Lydenburg district will be comparable to those of the Witwatersrand. In the Potgietersrust district, where the principal ore deposits can be worked for some years as quarries, the mining cost will be much lower. Operations have not progressed far enough to permit an estimate of treatment cost, but in my opinion treatment and refining will amount to far more than half the total cost. Let us suppose, for the sake of argument, that a ton of ore can be put into the mill for $1.25. Then let us assume that it costs three times this amount to treat it and recover as marketable metal 80 per cent of the platinoid content. Now let us add 50c. a ton for taxes and general expense. If we start with 3.5 dwt. ore, we must mine and treat 7.15 tons to recover an ounce of platinoid metal, say 8 tons of ore to get an ounce of refined platinum. Eight tons at $5.50 per ton equals $44 per ounce. If we had



In the banded ironstones on Tweefontein

[13] P. A. Wagner and T. G. Trevor. "Platinum in the Waterberg District." Industries Bulletin, Series (South Africa) No. 101.

started with 3 dwt. ore, our ounce of refined platinum would cost about $52. While all this is purely speculative, I see no basis for the hope put forth by certain prospective consumers that the price of platinum will ever fall to a parity with that of gold.

There is, of course, the danger, from the producers' standpoint, that the prospect of a large amount of platinum coming suddenly to market will depress the price below the cost of production. With a reasonable degree of co-operation, such a condition should not prevail for long. The South African diamond industry has shown what can be done along these lines.

Possibilities of Alluvial Deposits

Although no alluvial deposits of platinum have so far shown much promise, I do not feel that this type of occurrence has yet been given a fair chance. The opportunity to find a large deposit in the Dwars or Steelpoort valleys is not very good, owing to the comparatively small alluvial areas there encountered. Nevertheless, payable small deposits should occur at points along these streams. As far as I know, there is as yet no exposure of bedrock in, or reasonably close to, the channels of either of these rivers. Furthermore, no such exposures are likely to be made during the rainy season, December to April, or for a period of two months thereafter.

Of course, the amount of denudation in South Africa, and consequently the volume of the resulting gravel deposits, is far less than in the Pacific Coast States, western Canada, or Alaska. The Olifants is the largest stream wholly within the borders of the Transvaal, and must have eroded a considerable number of cubic miles containing millions of cubic yards of platinum-bearing reef matter from the two ore horizons of the northern part of the Lydenburg area. Some prospecting is now in progress on the north bank opposite farm Jagdlust, No. 333.

Rhodesia

So far in this article I have made no reference to platinum occurrences outside the Transvaal. Encouraging reports as to deposits found during the past year along the Great Dike in Southern Rhodesia indicate that this colony may also prove to be a source of platinum.

Volatilization Process Tried on Washington Ores

Attempt to Convert Finely Divided Metallic Sulphides in Dry Table Concentrate to Oxides by Subjecting to Temperature of 2,400 Deg. F.

AN INTERESTING experiment in treating complex ore has been made by the Consolidated Silver Mountain Mines Co. at that company's property in Stevens County, Wash. A fair-sized orebody of commercial grade is available, but there is a 21-mile haul to the railroad, and as the ore could not be treated by standard methods, the directors decided to experiment locally on a reduction process.

Dry table concentrate, under air pressure, is introduced into a combustion or volatilizing chamber, where a temperature of 2,400 deg. F. is maintained by the use of three high-pressure Denver Fire Clay crude-oil burners. The process is based on the supposition that finely divided metallic sulphides, when subjected to the high temperature in the furnace, will be converted to oxides and a clean separation can be made between the iron, sulphur, and gangue on the one hand and the lead, zinc, arsenic, and silver.

The furnace is 11 ft. 3 in. long by 5 ft. 9 in. wide and 6 ft. high, all inside measurements. The outlet flue is directly above the ore inlet and burners, and connects with 120 ft. of 18-in. round pipe, which in turn connects with the baghouse. The baghouse is 80 ft. long by 10 ft. wide and 16 ft. high. A vacuum chamber 80 ft. long by 10 ft. wide and 2 ft. deep is connected with a No. 5 suction fan. The lower side of the chamber is covered with 16-oz. canvas, which acts as the filtering medium.

Concentrate as charged to the furnace has the following probable percentage composition: PbS 9.8, ZnS 14.1, FeAsS 29.1, "Insoluble" 6.5, FeS_2 29.2, Al_2O_3, and remainder, 11.0, and Ag 36.0 oz. per ton. The fume or "oxide" resulting from the treatment has the following probable composition: $PbSO_4$ 26.3 per cent, ZnSO. 7.9, ZnO 11.1, As_2O_3 32.7, "Insoluble" 0.5, Carbon and balance 21.4, and Ag 23.0 oz. per ton. This material was found to be free from iron, and all but 4.3 per cent of the 27.2 per cent sulphur had been eliminated. An iron slag formed in the furnace which contained considerable silver and some zinc. The backers of the process say that under proper operating conditions very little silver will be lost in the slag.

The final stage is the separation of the arsenic by sublimation from the lead, zinc, and silver in the fume or "oxide" and the melting of the residue into a solid form for shipment to the smelter. This phase of the process has not been tried carefully as yet on a large scale, and much depends upon A. J. Kobel being able to make this separation as he feels confident that he can do. To him goes full credit for the laying out of the plant; as president and manager of the company he has worked tirelessly to find a solution of the company's metallurgical difficulties.

The above description was given by Rowland King, mining engineer with the C. M. Fassett Co., at a recent meeting of the Mining Bureau of the Spokane Chamber of Commerce.

Formation of Copper Sulphate in Roasting

The conversion of the copper in burnt pyrites into the sulphate by the action of mixtures of sulphur dioxide and air under various conditions has been investigated by A. E. Makovecki and K. N. Schabalin, according to an article in the *Russian Journal of Chemical Industry* (1925, 1, 21-23) abstracted in *Chemistry and Industry*. The range of temperature most favorable to the formation of copper sulphate in this way is 600 to 640 deg. C., and the extent to which the action proceeds increases with the proportion of sulphur dioxide in the mixed gases. Dissociation pressures of ferrous and ferric sulphates are greater than the like pressure of copper sulphate, but the copper rendered water-soluble contains about 20 per cent of water-soluble iron salts. On the industrial scale, the reaction may be carried out in a furnace of the Herreshoff type.

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief. Letters will not be printed unless the author's name and address are known to the editor.

Mine Promotion and Magazines

THE EDITOR:

Sir—I have read a number of recent articles in your paper on mining promotion. They are very interesting, and bring to mind the need of a clear understanding on the part of the public as to what constitutes a legitimate mining enterprise.

There are two kinds of promotion and two kinds of promoters. One is the type-and-paper promoter, who seeks only to mine the public, depending upon his profit from the gullible rather than the legitimate development of undiscovered resources. The other is the prospector and promoter who, after finding a prospect of the ultimate success of which he is thoroughly convinced, is in great need of money to prove the property. Often it is exceedingly hard for the latter type of promoter and prospector to get sufficient funds to carry on his work in competition with the extravagant statements of the paper-and-type individuals.

In recent months there has been a great deal of indiscriminate criticism of mining promotion or oil promotion without any distinction being drawn between the fraudulent promoters and those who are seriously attempting to develop the resources of the country. This, it seems to me, is extremely unfortunate.

I was very much interested in an article in the *Literary Digest* headed "White Collar Bandits." No doubt many of the statements made in this article were true and perhaps a billion dollars is annually invested in securities of a speculative nature, a large proportion of which are wholly void of speculation because the operators directing the expenditure of the said funds know, when the money is invested, that it is wholly lost to the investor. But the following issue of the *Literary Digest* carried with it another statement showing the operations of the Stock Exchange. As I recall it, in a single week the depreciation in stock values held by the general public throughout the country amounted to something like $2,500,000,000, so we can readily see that there are losses sustained in other lines than purely wildcat speculations in unproven properties.

I should like to place the blame where it appears to me it rightfully belongs. Magazines, newspapers, and so forth are the natural means by which the public obtains its knowledge and information. If a legitimate mining promoter tells the public that he has merely a good prospect and seeks only sufficient money to exploit and prove his theory, and offers a story regarding it to one of these magazines, the chances are that it will not be taken. As a consequence, the door is shut in the face of the public and an opportunity is presented for every "Get-Rich-Quick Wallingford" with extravagant statements and unfounded claims with which to gull the public. If one of these promoters claims to have discovered the "Queen of Sheba" gold mine, with several million tons of $1,000 ore, and only wishes to place a few million shares with the public to buy strings with which to tie the sacks, his proposition gets past with a whoop. On the other hand, if a man has a splendid showing, close-in, in a district that has produced millions of dollars, it is often hard to raise sufficient money even to do the initial development work. So I believe that to minimize the frauds it would be the best thing possible if magazines and papers would take up the cause of the man who is really battling for the development of the country's resources, and that when he can show by proper references the honesty and earnestness of his intention, he should get the support which he deserves. I believe that this will go far to eliminate the frauds and expose the nefarious methods which are practiced upon the public.

RUSSELL F. COLLINS.

Spokane, Wash.

Magnetometric Surveying

THE EDITOR:

Sir—Since the appearance of my article, entitled "Magnetometric Surveying as an Aid in Exploring Placer Ground," which appeared in your issue of Feb. 20, I have been deluged with inquiries. As it is impossible for me to attempt to answer more than a small per cent of these inquiries, and since most of them come either directly or indirectly from readers of your publication, may I request that you print the following, which answers generally the most sensible questions:

Magnetometric surveying will not locate a mine, either "lode" or placer. When carried out by competent persons, the survey will map any given area with respect to relative magnetic intensities in much the same manner as a contour map is made. With such a map in hand one may intelligently select the best ground, in any area covered, in which further to prospect and develop a mine. Veins and hidden orebodies (placer ground being included in the latter division as ore disseminated in gravel) can be located and mapped in plan, and, in some cases, a reasonable idea gained of depth. But it must be borne in mind that all magnetometric work is a preliminary and not by any means the final step in the development of a mine.

I have tried to avoid the theoretical side of magnetometric work, but I believe that I did not stress sufficiently one point which opened up for me a more comprehensive view of the work generally. This point is the immediate coupling in one's mind of magnetometric surveying and magnetism—magnetism in the sense of a direct influence on the instrument of a magnetic orebody. I believe that in all cases of orebodies the influence is indirect.

First, let us forget the magnetic needles and imagine the earth's surface to be circumscribed by what we will

term directional lines of electromagnetic force. Any magnetic needle, free from mechanical friction or other deterrent influence, will tend to align itself parallel to these directional lines of force. The presence of any metallic mineral in the earth's crust causes measurable deflections in the normal direction of these lines of electromagnetic force, and this deflection is in most cases directly over the center of the orebody, or at right angles to the lines of force. With this conception as a basis, one has a more definite idea as to how to diagnose the results of any magnetometric survey.

I am not an agent, directly or indirectly, for any manufacturer of scientific instruments. I have used the combined magnetometer made by Fr. J. Berg, of Stockholm, Sweden, but there may be other makes and designs of equal or greater accuracy. Anyone undertaking magnetometric work should be prepared to give long and careful study to the subject and must be prepared to find the results of his early endeavors both puzzling and confusing.

As there have been more than 150 inquiries as to where a magnetometer may be purchased, it would not be surprising that a great divergence of opinion should be forthcoming in the near future. However, in a field of 150 starters there should be at least a fair number whose perseverance and capacity for logical deduction will produce results of merit. K. C. LAYLANDER.

Keithly Creek, B. C., Canada.

Patent Litigation

THE EDITOR:

Sir—Few, if any, patentees will agree with the opinions expressed in your editorial of March 27 on "Side-Feeding Reverberatories and the Carson Patents." There are many matters pertaining to patent litigation which could be very profitably discussed by all interested in such affairs, and this means practically every one connected with a progressive industry.

The very thing you deplore—that of a patentee seeking legal and financial assistance on a partnership basis in defending his patents—is usually the one thing a patentee is forced to rely upon for even a small measure of justice. Practically all patentees, as individuals, would be satisfied with a reasonable compensation. This is usually denied, and the patentee is forced to submit to a decision of those who deny his rights and whose decision would be final, or to protect himself through litigation.

This brings us up to the principal point at issue. Patentees are usually poor, and few indeed could stand the expense of the present-day patent litigation. This compels the patentee to see his invention and his expenditures of time and money appropriated by others without compensation, or to give a large portion of the interest in his patents to those who can carry the burden of litigation. He would not lose anything if he gave it all, under such conditions. It is not because the patentee wants to adopt such an alternative, but because there is usually no escape from it, and instead of being an injustice, it is positively the only avenue of justice open to him, and those who share his risk and expense cannot be expected to do so for the benefit of those who force the litigation.

In the Carson case, for example, the first time the case was tried, Carson was given nominal damages, which was an invitation to litigate some more. In the second trial Carson was given even less consideration. The case was then taken to the United States Court of Appeals; then to the Supreme Court of the United States; and then a motion was made for a new trial; and the end is not yet, or as stated in your editorial "without doubt Judge Rudkin's decision is only the beginning of extended litigation." It must be evident, even to the most casual observer, that Carson, who is a poor man, could not possibly defend his rights unassisted, no matter how just those rights may be, and this is practically the case with most patentees and inventors. Whatever the injustice may be in a condition of that sort, the injustice "which stinks unto Heaven" is the injustice toward the patentee, especially in view of the fact that if he is poor he has to live and die in poverty while his patents are litigated.

Most of the trouble in patent litigation comes from the greed which denies the patentee even a reasonable sum for his invention. If a patentee is obliged to litigate to establish his rights, why, according to your editorial, "should he be paid a reasonable amount"? A patent, once litigated and affirmed, is the same as any other property with a valid title, and all sorts of property remains undeveloped by the owners and no question is ever raised that he should be obliged to take "a reasonable sum." Between two men, one spending his time and money in developing an invention and the other in developing a mineral deposit, and both equally successful, why should one be obliged to take a "reasonable sum" for his invention, and the other be allowed to get all he can for his mineral deposit?

It must be evident, also, even to a casual observer, that patentees are frequently not in a position to put their inventions into practical operation, especially in these days of large industries and large consolidations. A reverberatory furnace for practical smelting is an expensive affair, and there is not the slightest reason to conclude that Carson could have built such a furnace or operated it profitably even if he could have built it and operated it successfully metallurgically.

This brings up another vital point in connection with patents and patent litigation. If the poor inventors are to be completely discouraged or put out of business through piratical litigation, the supremacy of the United States as an industrial nation would soon be placed in jeopardy. This is evident from the fact that great progressive movements are rarely if ever made through wealth or through securely established channels. The great humanitarian movements, whether of politics, religion, science, or invention, have always come from the lowly and the obscure, or, as some of our religious friends would say, "out of Nazareth," and it would not seem as if this is accidental. (The workings of the human mind are still too obscure to evolve epoch-making ideas on the factory principle.)

In the transmission of intelligence, for example, did the owners of the mail system invent the telegraph? Did the wealthy owners of the telegraph invent the telephone? Did the wealthy owners of the telephone invent wireless? In the flotation process Carrie Everson will probably be generally recognized as the most important factor in its discovery and disclosure, and while the Everson patents were issued in 1886 it was not until a quarter of a century later that capital became alive to its possibilities, probably largely because it came from the lowly and the obscure instead of from a pedigreed laboratory. And while millions have been made out of the flotation process, Carrie Everson, with all of her poverty, was obliged to

become a benefactor of the rich. She did not even receive "a reasonable amount," and the chances are that she did not even get enough out of her discovery to pay for the patents. If she had put the same time and money into a mining prospect of the same merit as her invention, her posterity would all be millionaires.

In the patent litigation the matter of a patent appellate court should be given consideration. At present there are nine United States appellate courts, and each may render a decision independent of the others. It has frequently been suggested to have one United States Court of Appeals confined to patent cases, and that the decision of this court should be final. This reform in patent litigation should not be delayed any longer. In the organization of such a court of appeals, however, the judges should not be confined to members of the legal profession. Lawyers as a rule have no great amount of scientific or technical training, and rarely, if ever, come in direct contact with industrial and scientific research, and in patent litigation the scientific and technical points involved very greatly outweigh the legal aspects. There is not the slightest reason to conclude that men of legal training are any more capable of passing on scientific and technical points involved than that scientists and engineers are capable of passing on intricate points of law. There should be one patent court of appeals in the United States, and the decision of that court should be final, but the judges of such a court should be composed, say, of two men from the legal profession, and three men from the different branches of the arts and sciences, assuming the court to be composed of five members. In addition to this, provision should be made for one or more floating judges; that is to say, in the litigation of an important or intricate case, an expert in the particular field to which the litigation pertains should be chosen as a temporary judge. Such a judge could be selected by the regular members of the court from a list of available men approved by both litigants. Such a reorganization of the patent judicial system would be in line with common sense and present-day civilization. It is in line with Patent Office procedure; and the Patent Office is very highly organized and highly efficient. The patentee and the examiner at least know what each is talking about. When an inventor files an application for a patent, say in chemistry, radio, or electrolysis, he has at least the satisfaction of knowing that it will not be passed upon by an examiner who knows nothing about these matters, even though he is an expert in farm implements or labor-saving devices, and yet an examination by an examiner skilled in any branch of science and invention would be vastly more satisfactory than it would be by an examiner who knew only law.

Certainly, in the ordinary affairs of life, a man does not employ an engineer when his health is failing, nor does he employ a doctor to build a bridge or a factory or to devise a metallurgical process. Yet in the eyes of the average American, a lawyer, acting as a judge, is capable of making just decisions in cases ranging all the way from bootlegging and divorces to the fine discrimination between the 2,500 radio patent applications which it is said are now pending in the United States Patent Office. Truly the legal profession makes a mere mortal omniscient, and there is no reason why the members of the legal profession should object as long as the people believe it, but it is hard sometimes on the patentee.

WILLIAM E. GREENAWALT.

Denver, Colo.

Visit Meteor Crater

THE EDITOR:

Sir—I hesitate to take up more of your time and space with another letter about Meteor Crater, for I fear your readers have been getting a pretty heavy dose of it lately. But Mr. J. B. Hastings's communication should not be allowed to stand unanswered. I cannot understand how, with his acknowledged lack of information on the subject, he still feels an unconquerable urge to burst into print on a subject so carefully studied and so fully understood by others. Of course, the origin of the crater by solfataric action has been "considered and discarded by capable men." I know of no theory worthy of the name that has not undergone severe tests by us, and none but the meteoric theory has been able to survive. There is no evidence of any kind to support the solfataric theory, as has very clearly been brought out in my papers and also in one by the distinguished petrologist, Dr. G. P. Merrill, of the U. S. National Museum. He has recently written to me that the peculiar metamorphism of the siliceous sandstone furnishes one of the strongest arguments in favor of the impact or meteoric theory of origin of the crater.

Mr. H. L. Goodwin's letter of last week, on the other hand, conveys a much more valuable idea. It shows that there is a demand, among mining engineers, for a chance to get at the facts about the Meteor Crater. Leaving out of consideration those who are unable to assimilate facts when they see them, this demand can best be satisfied by personal visits.

Meteor Crater is 6 miles south of Sunshine Station, Ariz., on the main line of the Santa Fe railroad. It can easily be reached by automobile from Winslow, 20 miles to the east, or Flagstaff, 45 miles to the west. Although no active work is now going on, I am employing a caretaker, Mr. John Allen, who lives at the crater and would, I am sure, be glad to show any visiting engineers any part of it they may wish to see. I hereby extend an invitation to any interested engineer to stop off between trains and visit the crater. I am sorry that it is impossible for me to arrange for transportation from Winslow or Flagstaff, but I am sure that visitors will be well received at the crater itself. It would be better to make arrangements with Mr. Allen, whose address is Canyon Lodge, Coconino County, Ariz., or with me, before a contemplated visit.

I hope that this will furnish a means of clearing up some of the mystery which underinformed persons, including newspaper reporters, have thrown around the Meteor Crater enterprise. The recent article in the Hearst newspapers, was evidently written by someone not familiar with the facts.

DANIEL MOREAU BARRINGER.

Philadelphia, Pa.

Recovering Iron at Ducktown

THE EDITOR:

Sir—In your issue of April 10, mention is made of a plan to save iron from ores milled at Ducktown, Tenn. It may be of some interest to you to know that for the past six months the Tennessee Copper Co. has been floating a copper concentrate, followed by flotation and recovery of an iron concentrate. This latter product has been roasted and the calcines subsequently sintered, making a 64 per cent iron sinter for use in iron blast furnaces.

J. N. HOUSER,

Copperhill, Tenn. General Manager.

News of the Week

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Summary

WAR MINERALS relief act liberalized, allowing claims to be filed within ninety days—Potash bill cut from $550,000 to $100,000 per year.

German-French potash pool completed, allotting Germany 70 per cent and France 30 per cent of sales, for seven years.

Ore-dock facilities improved at Tampico—Mexican mining law to go into effect this month—labor troubles in Jalisco.

Consolidated Mining & Smelting Co. of Canada has large production in first quarter 1926.

Noranda Mines secures cheap electric power—More than 4,000 claims staked at Red Lake.

New diamond fields discovered in South Africa—Mineral production of Union shows slight gain—Diamond combine stabilizes prices.

Vermont copper mine leased to American Metal Co. for twenty-five years; flotation plant to be installed.

Joplin zinc production curtailed.

Presidio Mining Co., Shafter, Tex., under option to Peñoles Mining Co.—Boulder grubstake association continues its work.

Hollinger acquires claims in Beardmore gold area—Flin Flon copper to have railroad soon.

Salt River Valley, Arizona, has abundance of rain, and reservoirs are rapidly filling.

Increased Production by Consolidated Mining & Smelting Co. of Canada

During the first quarter of this year the Consolidated Mining & Smelting Co. of Canada received at its Trail smelter 127,997 tons of ores and concentrates and produced 30,608 tons of lead, 14,197 tons of zinc, 2,194 tons of copper, 12,456 oz. of gold, and 1,707,508 oz. of silver. This compares with the receipt of 96,611 tons of ores and concentrates, from which were produced 20,063 tons of lead, 7,995 tons of zinc, no copper, 5,614 oz. of gold, and 875,064 oz. of silver during the corresponding period of last year. The larger receipts during the first three months of this year were due in a large measure to the new concentrating service. The larger output of gold came principally from the Allenby Copper Corporation's concentrates. Large increases in lead, zinc and silver production are due partly to the larger output of the Consolidated company's mines and of independent mines and partly to improved metallurgical conditions at the smelter. The twelve largest ore contributors during the three months were: the Consolidated company's mines, with 104,583 tons; Allenby Copper Corporation, Allenby, 7,075 tons; Lucky Jim, Zincton, 4,357 tons; Bluebell, Riondel, 2,100 tons; Silversmith, Sandon, 1,338 tons; Whitewater, Retallack, 1,318 tons; Quilp, Republic, 1,284 tons; Cork-Province, Zwicky, 1,047 tons; McAllister, Three Forks, 839 tons; Ruth-Hope, Sandon, 620 tons; Paradise, Invermere, 461 tons; and Yankee Girl, Ymir, 325 tons.

The Consolidated has increased the number of its directors by two and the directors' fees have been advanced to $500 per year from $400. Sir Vincent Meredith and Sir Herbert Holt have been elected to fill the two new positions and E. W. Beatty, president of the Canadian Pacific Railway Co., has been chosen to fill the vacancy on the board caused by the retirement of H. S. Osler.

Ore-Shipping Facilities Being Improved at Tampico

To handle exports of precious ores and bullion through Tampico more expeditiously, the National Railways of Mexico is making extensive improvements to its docks. Last year 135,000 metric tons of antimony, lead, and copper were handled through this port, compared with 93,000 tons in the preceding year. One of the new wharves will be used exclusively for exporting zinc ores, concentrates and any other fine ores. About 36,000 tons of this kind of minerals went through Tampico in 1923; 45,000 in 1924; and 90,000 in 1925. Mining interests have advised that further increases are expected, and the National Railways of Mexico is getting ready to meet them.

Polish Diet Grants Zinc Industry Tax Exemptions

The Polish Diet has passed a bill conferring special privileges on the zinc industry in Poland, including exemptions from the capital levy and export duty. The object of the bill is to permit the conclusion of a contract with the Harriman interests and the Anaconda Copper Mining Co. A representative of the Harriman interests has been waiting for the passage of the bill to sign a contract with the Polish Government. It is expected now that the contract will be concluded at an early date.

American Chrome Products Company Organized at Butte, Montana

What promises to become a very important industry for Montana, as well as for the United States, is described in the announcement of the formation of the American Chrome Products Co., Butte, Mont., organized recently with a capital of 10,000 shares of $100 par 7 per cent cumulative preferred stock, 400,000 shares of $10 par common and $385,000 of 7 per cent purchase-money mortgage bonds, maturing up to July 1, 1937.

Through the efforts of Peter Geddes Grant, of New York, and Walter A. Kyle, J. P. Burgess, and C. A. Tout, of Butte, Mont, the company has taken over the "Benbow" group of seven claims, lying end to end, near Columbus, Stillwater County, Mont. On these claims a dike can be traced for over 10,000 ft., this intrusion containing high-grade chrome ore with an average width of 4 ft. Ore will be developed by tunnel, which will give backs of over 400 ft. and according to estimates of engineers should develop over 1,000,000 tons of ore above the tunnel level. The claims are within six miles of the Mystic Lake power plant of the Montana Power Co. and close to deposits of coal, limestone, natural gas, soda, and potash. It is planned to erect a concentrator and plants to manufacture ferrochrome and the bichromates of soda and potash. Scrap iron will be used in the ferrochrome furnaces, and sulphuric acid for the manufacture of chemicals will be obtained from the Washoe plant of the Anaconda company.

Mr. Grant and his associates have spent many thousands of dollars in conducting metallurgical and chemical tests

on the ores, these having been made under the direction of some of the most competent ferro-alloy and chemical authorities in the United States.

James H. Rowe, of Butte, is president of the newly formed company, Peter Geddes Grant, of New York, vice-president, Paul A. Gow, manager of North Butte-Tuolumne Merger, vice-president, and W. D. Kyle, attorney, of Butte, secretary-treasurer. The above named with Angus McLeod, of the Butte & Superior Mining Co., comprise the directors.

Revival of Zinc Mining in Northern Arkansas

The mining industry at Zinc, Ark., has been practically dormant since 1916, but the camp is beginning to take on new life, and should be making a fair production again by the middle of the summer.

W. C. McCurry has closed a lease on the Rhodes mine. The property is equipped with a small concentrating plant, which will be put into operation as soon as enough ore can be opened up to insure steady operation.

L. L. Brown has a force of men at work on the Jack Pot property, which he recently leased, and is making a good production of hand-cobbed silicate of zinc.

B. H. Ragland and associates are strip-mining zinc carbonate at a mine on Hoosaw Creek, between Zinc and Bellefonte. They have shipped one car and have another one almost ready for shipment.

A new shaft is being sunk on the Coker Hollow property. This mine is equipped with a mill, which will be started up as soon as enough ore is available to insure its steady operation.

The Bald Hill Mining Co., operating the Bald Hill mine, on the head of Cave Creek, is making steady production, at its 100-ton mill at St. Joe, Ark. Four cars of carbonate concentrates have been shipped, and several cars are in the bins ready for loading.

Virginian Mine and Mill to Start Soon

The Virginian mine, 15 miles northwest of Hillsboro, N. M., has been taken over by Texas interests. Unusual rainy weather has delayed the completion of the flotation mill. It is hoped that mine and mill operations will be started some time in May. About 30,000 tons of ore averaging 18 oz. in silver is reported as blocked out. John Moffitt, of Kingston, N. M., is owner.

Cuyuna Manganiferous Ores Being Studied by U. S. Bureau of Mines

The experimental blast furnace maintained by the U. S. Bureau of Mines at its Minneapolis station is being used to solve the problem of efficient utilization of manganiferous iron ores of the Cuyuna range and other deposits of the United States. The object of the experiments is to determine the grades of metals to be secured and what types of slag will give the highest recovery of manganese. Because of the fact that more alumina occurs in these ores than the regular Lake grades, these experiments will also answer questions concerning their smelting.

Gold Discovered at Kramer, Calif.

The accompanying photograph shows the Herkelrath discovery at Kramer, Calif. It is too early to make any prediction as to the real value of the ore-body. Excellent pannings have been obtained from rock on the dump, the material being a highly ferruginous porphyry carrying native gold. Mr. Herkelrath has disposed of part of his holdings, and the new owners are installing hoisting equipment for deeper work.

Photo by Haverstock & Payne, Los Angeles, Calif.

Scene of gold strike, near Kramer, Calif.

About six miles west of this site and about three miles south of the depot at Kramer further exploration work is being carried on in an old field where quartz veins are exposed. Some high-grade silver ore has ben found by the Hiawatha Mining Co.

Joplin Production Curtailed—Prospecting and Development Continue

Individual curtailment of mining operations continues in the Joplin-Miami district, being particularly marked for the week ending April 24 by the closing of all the mines of the Barnsdall Zinc Co. District manager P. B. Butler announced the properties would be closed for at least a month. They produce approximately 2,500 tons of zinc concentrates per month, and were closed solely because the trend of activity has been toward overproduction.

Drill development of the new sheet-ground area near Baxter Springs, Kan., continues, with promising results. The Eagle-Picher Lead Co., after putting down many holes on its twenty-acre tract immediately southwest of the town, announces that at least fifteen of the twenty acres are well mineralized. The St. Louis Smelting & Refining Co. is sinking a shaft on the Ballard lease, which adjoins that of the Eagle-Picher Co. A number of other companies also are drilling in this vicinity, with good results.

The Eagle-Picher Co. is planning to work the Lytle mine, which is on the east side of the Blue Mound, just north of the Oklahoma-Kansas state line. It had been planned to work this property over the Amalgamated mill, but this concentrator was destroyed by fire recently, and the company has not decided whether to rebuild this mill or to erect a new one for working the Lytle deposits.

Tonopah District Produces 10,000 Tons of Ore Per Month

Bullion shipments from the Tonopah, Nev., district indicate unchanged operations, with gross value of approximately $175,000 per month. Tonopah Belmont is the largest shipper, with the Tonopah Mining Co., the West End Consolidated, and the Tonopah Extension following in the order given. Total district tonnage is about 10,000 tons of ore per month.

In the eastern part of the district Tonopah Belmont is successfully exploring known veins both by regular development and drills. By careful work holes have been drilled to a depth of 320 ft., using a Type S-80 drifter mounted on a 42-in. feed shell. This form of prospecting has proved quite adaptable in the Belmont property, and will undoubtedly soon be used in other mines of the district.

In the western part of the district Tonopah Extension is successfully battling its water problem on the deeper levels, now handling more than 2,000 gal. per minute. This company will start new work in the near future from its West Tonopah shaft on the 1,100 level. The West End Consolidated is producing good ore from the Tonopah "76" ground, held under lease, and is raising and sinking from the 800 level in the newly discovered orebody.

Booth Mining Company Reorganized

The Reorganized Booth Mining Co. of Goldfield, Nev., controlled by George Wingfield, is reported to have purchased a large stock interest in the San Rafael company and in three other companies owning promising ground. This is regarded as an important event in Quartz Mountain history, as Mr. Wingfield is well advised by competent engineers.

News From Washington

By PAUL WOOTON
Special Correspondent

War Minerals Relief Act Liberalized; All Claims May Be Reopened—Potash Appropriation Bill Cut to $100,000 per Year

LIBERALIZATION of the War Minerals Relief Act was approved unanimously by the Senate on April 27. It provides for appeals to the Court of Claims with the following provisos:

"That in cases where final decisions of the Secretary of the Interior have been heretofore rendered said appeal to the Court of Claims shall be made within 90 days after the passage of this act; and in all cases where final decisions of the Secretary of the Interior have not heretofore been rendered, appeals from such decisions to the Court of Claims shall be made within 90 days after such decisions shall have been rendered by said Secretary; and that no acceptance or acquittance by any claimant of or for any settlement made heretofore by the said Secretary shall prevent or estop any appeal to the said Court of Claims, as herein provided for."

One new section of the bill provides that no agent or other person engaged in prosecuting any claim under the provisions of this act shall, directly or indirectly, contract for, demand, receive, or retain for such services a sum greater than $1,000, or, in the case of awards under this act over $10,000 in amount, a sum greater than 10 per cent of such award.

Potash Bill Sustains Severe Reduction

On being advised that the Bureau of the Budget would approve of no appropriation in excess of $100,000 annually the Committee on Mines and Mining of the House of Representatives has agreed to amend the Senate potash bill reducing the appropriation to that amount, to be available each year for a period of five years. The bill as it passed the Senate called for the expenditure of $550,000 annually, or $2,750,000 over the five-year period.

It is apparent that the Administration is giving support to this measure rather reluctantly. After the bill passed the Senate, however, it was apparent that the measure authorizing the expenditure of $550,000 annually had strong support. It was known that the Committee on Mines and Mining would report it favorably. There was objection to the measure in certain quarters on the ground that the prospecting should be done by private enterprise. It was pointed out, however, that private enterprise would be reluctant to expend large sums in prospecting for potash, because of the realization that it would be difficult to secure a tariff on the fertilizer material and because of the recognized impossibility of competing with the German and French deposits without such protection. Secretary Hoover in his testimony before the committee pointed out that the establishing of the fact that we have potash deposits will protect us from extravagant prices, even though the potash should not be developed. Frank L. Hess, of the staff of the Bureau of Mines, also pointed out that production is unimportant so long as we know where the deposits are and how rich they are, so that use could be made of them in time of emergency.

So as to assure to the government the return of the money which it would expend, a subcommittee of the Committee on Mines and Mining has practically rewritten the Senate bill.

Production of Molybdenum in United States in 1925

Only two molybdenum mines were operated in the United States in 1925, according to the U. S. Bureau of Mines. The market has not yet grown sufficiently large to warrant the operation of other mines. The two which operated are well equipped and are owned by companies which make their own molybdenum compounds for the steel trade.

In Colorado the Climax Molybdenum Co. operated throughout the year at Climax, about 15 miles, by rail, northeast of Leadville. In New Mexico, the Molybdenum Corporation of America operated its mine in Sulphur Gulch, about 7 miles east of Questa. Together the companies produced 97,665 tons of ore, from which was made 864 short tons of concentrates carrying 72.7 to 85 per cent molybdenum sulphide, equivalent to 1,154,065 lb. of molybdenum (metal).

A few tons of molybdenite are used each year for making chemicals, and a few thousand pounds of molybdenum is consumed by the electrical industry, but the bulk of the production is used in machine steels.

Vizcaya Iron Production Declines in 1925

Production of iron ore in the province of Vizcaya, Spain in 1925 totaled 2,083,740 metric tons, against 2,383,000 tons in 1924 and 3,864,000 tons in 1913, states a report to the U. S. Department of Commerce. At the end of 1925 there was estimated to be 700,000 tons of the mineral on hand.

The quantity of iron ore exported through the port of Bilbao in the course of the year was estimated at 1,500,000 tons. This is small if compared with exportations previous to the war, and still smaller when it is taken into consideration that from this quantity 800,000 tons was shipped by a foreign company, formed by siderurgical enterprises which consume the mineral in their own works.

A New Process for Making Aluminum

According to the U. S. Department of Commerce, the Czechoslovak Government has issued a patent to two local scientists, Otto Lederer and Walther Stanczak, of Prague, covering a new process for the extraction of aluminum from clay and bauxite. The method has been tested by the Ministry of National Defence, which has reported that aluminum free of iron and silicic acid can be produced from low-grade materials at a lower cost than at present.

The German-French Potash Pool

Seventy Per cent of Sales Allotted to Germany; Thirty Per Cent to France

The Central European Potash Pool has been recently formed. After the war had broken the potash monopoly, formerly in the hands of Germany, there was a sharp competition between the German and French producers. The new Alsatian-French potash producers, supported by state subsidies, tried to secure a large portion of the world market, and to a certain extent these efforts were successful. However, it soon became evident that such a competition was unprofitable, and those interested asked for a mutual understanding with the German and French producers. The first step in this direction was made in 1924, when the German and French potash works came to an agreement in regard to the treatment of the American market. During the summer of the following year, 1925, the basis was broadened and territorially fixed. This agreement provided that Germany should supply about 70, and France about 30, per cent of the quantities to be sold on the world's market. The arrangement of 1925 was a one-year contract.

The advantages obtained by this arrangement were so great that it was easy to create the foundations for a seven-year contract, to begin May 1, 1926. The sales will be on the basis of 70 per cent for the German and 30 per cent for the French producers. A larger increase of sales calls for a moderate price policy of the united potash works on the world market. For in Germany as well as in France the capacity of the potash works exceeds the demand and what is needed is not so much high exports prices, but large sales, which again are made possible only by cheap prices. There are signs that before long a powerful competitor will appear for the Central European potash producers. It has long been known that outside of the potash deposits of the north German lowland (with extensions to Baden and Alsace), potash deposits occur in other places. In Hungary (Kalusz) deposits of potash had already been exploited to a small extent before the war, and after the war quite extensive deposits have been exploited in Spain. But by far the most serious competitor will be the United States, especially in the State of Texas. At all events, it is evident that the Central European Potash Pool can easily be threatened by new productions in other countries, and prices kept down.

Boulder Grubstake Association Continues Its Work

Boulder County, Colo., will continue its novel community prospectors' grubstake movement this year, increasing the scope of the work through provision of increased funds. Three thousand dollars will be raised, as compared to $1,800 distributed last year. As soon as snow is off the higher slopes—some time between May 15 and June 1—prospectors will be sent into the field. Work is now under way among the merchants and professional men of Boulder securing pledges to carry on the work. Memberships cost $1 a week over a period of twenty-five weeks. Some subscribers take as many as ten memberships.

Prospectors must be approved by the executive committee, and no man who has means to carry on the work for himself is grubstaked. Claims developed are placed in trust, proceeds being divided three-fourths to the discoverer and one-fourth to the association. One claim opened up by a grubstaked prospector in 1925 in the Magnolia section now has a showing of ore which has caused engineers to value it at $5,000, which is nearly three times the amount expended for all prospect work last summer.

The executive committee named to be in charge of the prospecting this year is composed of J. W. Valentine, P. C. Johnson, R. W. Joslyn, L. E. Girard, George Teal, H. H. Donnelly, V. I. Noxon, Guy Miller, and William Mitchell. All are prominent in either business or mining circles in the county. This committee makes regular trips to the hills to check up on work by prospectors and to pass opinion on claims located.

American Mining & Leasing Co. to Operate Double Eagle

The American Mining & Leasing Co. has taken over the property of the Double Eagle Mining Co., Valley, Stevens County, Wash., on a five-year lease and a $150,000 bond. Ten per cent of smelter returns are to be paid on the bond. The lower tunnel has been driven 976 ft. and lacks 400 ft. of reaching a point under the ore above where a vertical depth of 800 ft. will be attained. Double Eagle has five patented claims, 200 acres of deeded land, and is equipped with ore bunkers, gravity tram, and housing. In the upper tunnel several shoots of high-grade silver-lead ore and some copper were exposed in 600 ft. of drifting at a depth of 250 ft.

Western Lead Inquiry Continued

The public hearing conducted by Deputy Commissioner Walther of the California State Corporation Department at Los Angeles, Calif., to determine whether the sale of Western Lead stock is unfair and unequitable in the case of A. W. Morris, a broker, presents interesting angles of great public interest. According to local newspaper accounts, Ira B. Joralemon, mining engineer and geologist, was called to the stand on April 27 and testified that the character and quantity of possible ore discoveries are unknown. Probably no ore will be found and the property will prove worthless. Joralemon termed the property a good prospect meriting careful development. Valuation of such a prospect is a matter of opinion and no cash payment for such a property could be recommended. A reasonable allowance for necessary development would be $90,000 and a further expenditure of not more than $100,000 seems justified. If no ore is found with that money the property should be abandoned. Nothing at present justifies consideration of a concentrator or other treatment plants. Widespread occurrence of a little lead together with other geological indications gives reason to hope that lead orebodies may be found.

Testimony was introduced showing that at certain times Julian sold stock on the exchange through one broker and bought stock through another on the same day, but Julian took the stand and denied that he made any "wash sales."

On the following day State Mineralogist Root and his assistant, W. B. Tucker, agreed with the conclusions of Joralemon that the property is only a prospect in which ore may or may not be discovered.

Efforts on the part of the State Corporation Department to secure the introduction of the books of the Western Lead Co. have failed, as have also efforts to secure a financial statement of the company's operations.

U. S. Treasury Mine Reopened

Work has been started to clean out and retimber the U. S. Treasury mine. This gold-silver property is about 4 miles southwest of Chloride, N. M., and about 55 miles from Engle, N. M., the shipping point. Considerable development has been done in the past, and the mine has been regarded as a low-grade property. Prospects of higher mill recovery by flotation have encouraged the opening up of this old property. Ray Grayson is in charge.

Vermont Copper Mine Leased to American Metal Co.

The American Metal Co. has leased the Elizabeth copper mine, at South Strafford, Vt., for twenty-five years, on a royalty basis, from the Anahma Realty Co., which is controlled by August Heckscher. The mine will be operated by a subsidiary company, the American Metal Co., of Vermont.

T. J. Rightly will be in charge. The mill is to be rebuilt and should be ready for operation in July or August. Flotation tests have shown a recovery of 90 per cent of the copper in a 22 per cent copper concentrate. Concentrates will be shipped to American Metal's smelter at Carteret, N. J., for treatment. It is planned to produce about 600,000 lb. of copper a month from the Elizabeth mine.

The Elizabeth mine is one of oldest copper mines in the United States, having been one of the main sources of copper before the copper mines of Michigan were discovered. The ore is pyrrhotite, containing 2 to 2½ per cent copper. The mine has been idle for a number of years.

Golden Chariot Mill Ready for Operation

Golden Chariot mine, at Julian, San Diego County, Calif., equipped with a concentrating plant using Simpson pneumatic flotation cells and a Joshua Hendy rod mill, has the mill ready for operation. The ore is high-grade gold, which will be run over amalgamation plates and then passed through the flotation machines. The deposit is a large one, and both mine and mill are well equipped. C. A. Ferrin is president and manager of the company. The Lead Mountain Mines, at Barstow, Calif., reports a fair grade of lead-silver carbonate concentrates from the mill which started a few weeks ago. The present Simpson installation has a capacity of 100 tons daily.

San Rafael Company Makes Regular Shipments

The Quartz Mountain district, in the northwestern part of Nye County, Nev., is quite active. This district is about three miles east of the Broken Hills, via Fallon. The main property, now owned by the San Rafael Development Co., of which L. D. Gordon is president and general manager, was in the hands of leasers until Dec. 31, 1925. During the last six months of the lease the lessees shipped lead-silver ore valued at more than $100,000. The San Rafael company has since the first of the year constructed suitable surface buildings, installed an adequate compressor and hoisting equipment, and started development work in the incline shaft, which is now 260 ft. deep. Ore is being shipped to Utah smelters at the rate of 15 tons per day, and shipments will soon be increased to 20 or 25 tons per day. The ore assays from $50 to $90 per ton, the principal values being in lead, with some silver.

Several other companies have entered the district, acquired close-in ground, and started work, but no developments of importance have been reported. The district has been visited by many engineers, and general opinion regarding its future is favorable.

Thunder Bay District, Ontario, Resumes Activity of Early Days

The old Huronian mine, near Kashabowie, in the Thunder Bay district of Ontario, which was a gold producer forty years ago, will be reopened by the Shields Improvement Co., of Montreal. A quantity of equipment has arrived at the property. The work is in charge of J. Harkness, mining engineer. A number of claims have been staked in the area adjacent to the mine.

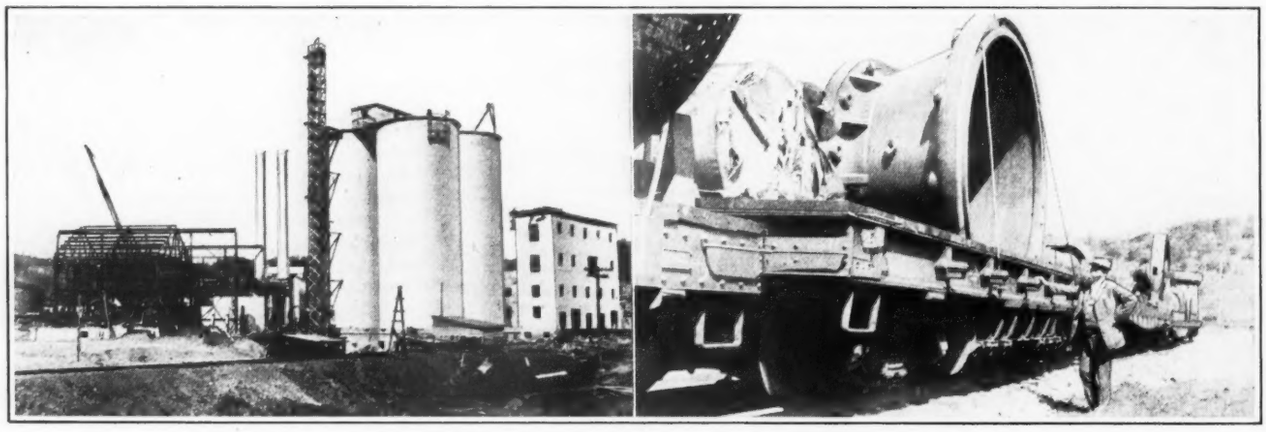
Flin Flon Copper to Have Railroad

According to a statement by Sir Henry Thornton, president of the Canadian National Railways, that system will co-operate with the Manitoba Government in building a railway line to the Flin Flon copper mine. The company will build the line as a branch of the Hudson Bay railway, and will take advantage of the provincial bond guarantee to obtain the funds for construction.

Limestone Products of Mother Lode Attract Attention

Non-metallic minerals are attracting some attention in the Mother Lode region. Both limestone and dolomite occur as lenses in or contiguous to the Calaveras formation. The limestone lenses are of economic importance. At Sonora a prosperous enterprise has been established, and lime, hydrated lime, and fine-crushed limestone are being produced and marketed. About 40 per cent of the lime produced in California comes from Sonora.

Just south of San Andreas, the Calaveras Cement Co. is completing a modern cement plant, shown in the accompanying illustration. Two 240-ft. rotary kilns with accessories have been erected, and it is expected that the plant will be in operation by June. A limestone lens near the plant is being prepared for open-pit mining. The plant is to have a capacity of between 3,000 and 4,000 bbl. per day.



Plant of Calaveras Cement Co., and large crusher ready for installation

An extension of the railroad from Valley Springs has been completed. North of Sonora two marble quarries are in operation, and a good grade of architectural marble is being produced. Several projects for supplying crushed rock are also under way.

Salt River Valley, Arizona, Benefited by Recent Heavy Rains

The heavy precipitation during March and April has broken the drouth of several years' duration in the Salt River Valley district of Arizona. This has brought a right-about-face with respect to the outlook for Salt River Valley projects, putting a rosy hue on prospects that had begun to look a bit speculative.

On Feb. 1, the elevation of the water in the Roosevelt reservoir stood at 105.67 ft., the height of the dam being 240 ft. The content of reservoir was 131,000 acre-feet, as against a total capacity of 1,640,000 acre-feet, or about 8 per cent of capacity. [An acre-foot equals 43,560 cubic feet.] On April 21, the elevation of the water in the Roosevelt reservoir was 159 ft., representing a content of 485,000 acre-feet, a gain of 354,000 acre-feet.

The Mormon Flat reservoir, farther down Salt River, toward Phoenix, has a total capacity of 94,000 acre-feet, and the water now stands at 55,000 acre-feet, a gain during the above-mentioned period of 23,000 acre-feet, or a total gain for both reservoirs of 377,000 acre-feet. The water in both reservoirs now totals 540,000 acre-feet.

The Salt River project has made great strides during the last eight years. Arizona produces 41 per cent of the copper of the United States. Last year the agricultural products amounted to one-third the value of the mineral production. In another decade the mining industry may be in second place! The recent rains benefit not only the farmers but the mines in the Superior, Globe, and other districts with respect to hydro-electric power from the water in the storage reservoirs.

Diatomite to Be Mined in Arizona

A large deposit of diatomite has been located in Pinal County, Ariz., and will be worked by mining men of Lordsburg, N. M. The property is near Mammoth, Ariz., on the state highway between that place and Winkleman. The finished product will be hauled to Tucson, a distance of 30 miles, for shipment. C. W. Davis, of the Arizona State University, has sampled the property, and his report was very favorable as to quality and extent of the deposit. The material has been used in the construction of the Stewart observatory at the university, and G. M. Butler, dean of the university, is constructing a house of this material in which he plans to carry on some interesting experiments as to its insulating properties in connection with climatic changes.

The deposit covers 3,240 acres, and is exposed in faces up to 100 ft. in height. A drilled well one fourth of a mile from the property showed this material to extend to a depth of 600 ft. The property is owned by the Mammoth Diatomaceous Earth Co., of which R. M. Reynolds is secretary and J. B. Foster is a director.

Rehabilitation of Neglected Mine

It is reported that John R. Ball, of Durango, Colo., and C. C. Magenheimer, of Los Angeles, Calif., are backing a project to reopen the Neglected mine, in the Oro Fino mining district, 12 miles northwest of Durango, La Plata County, Colo.

Hollinger Acquires Claims in Beardmore Gold Area

The Beardmore gold area, in the Port Arthur district of northern Ontario, is attracting much attention, and many properties have lately changed hands at substantial figures. Preparations are being made for active development on a number of claims. The Hollinger Consolidated has acquired control of nine claims, and is understood to be negotiating for additional properties. Twenty claims in two groups are being intensively developed by W. Claude Fox, of Toronto. On one of these groups, known as the Brooks claims, a crew of men under C. M. Brooks, mining superintendent, has been at work since last fall. A large amount of trenching, stripping, and crosscutting has been done, and assays give favorable results. Important discoveries of wide veins have been made on the Blackwater River, just west of Beardmore station. The assays show good gold content.

Industrial Commission Rules Against Mining Company in Disfigurement Case

An industrial commission referee recently ruled in a finding ordering the Meade Iron Co., Hibbing, Minn., to pay a miner named Susich $500 compensation for an infection of the skin which the miner claims was due to sparks from the anvil striking his face. In addition to the $500, Susich will also receive $1,200 as compensation for loss of employment and hospital expenses. This is the first individual on the iron ranges, so far as is known, that has been granted compensation for the loss of facial beauty. He claims the sparks so injured his face that an infection set in six months later, causing him great pain and eventually compelling him to quit his employment. Though the company physicians claimed that the infection was nothing more than plain eczema, another Hibbing physician sustained Susich's contention, declaring that the miner was suffering from lupus erythematosis, or tuberculosis of the skin, resulting from the burns by the sparks. Referee Albright also ordered that the mining company pay Susich for any further loss of time and hospital expense until the infection has been cured. The case will be watched with interest by other employers.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Noranda Secures Cheap Power—Red Lake Claims Now in Excess of 4,000

Official announcement has been made that Noranda Mines, Ltd., of Rouyn, Quebec, has signed a power contract with the Northern Canada Power Co. It is understood that that company obtains the cheapest power in northern Ontario, with the possible exception of one of the companies which owns its own hydro-electric plant. The price is understood to be in the neighborhood of $28 per horsepower-year, when operations are at capacity, which compares with approximately $50 in Cobalt, $50 in Porcupine, and $70 or more in Kirkland. A large part of the necessary supplies are on the ground, and it is expected that the line will be in operation and that power will be available this summer.

On the Nipissing property, in South Lorrain, high-grade ore has been encountered on the 200 level. This ore is not the continuation of the No. 5 vein of the Canadian Lorrain, and is understood to extend at right angles to it. The Nipissing report for the year 1925 was about as expected. Production amounted to 2,212,000 oz., a decrease of 800,000 oz. compared with 1924. With regard to the question of dividends, which call for $720,000 a year, at the present rate, it is stated that the present 3 per cent quarterly rate can be maintained for some time and that there is no immediate prospect of its being cut. Further bonuses, however, cannot be expected unless conditions change.

The Ontario Government returns for the month of March show that in Porcupine 268,545 tons of ore was milled, and the recovery amounted to $2,353,829, an average of $8.70 a ton. This establishes a new high record for the Porcupine camp and a new high record in monthly gold production for Ontario. The March output in Porcupine was about $450,000 greater than that for February. In Kirkland Lake, during the same month, 39,927 tons was milled, the recovery being $513,617, an average of $12.83 a ton. The total for all the gold mines was 308,472 tons, with a recovery of $2,867,446, an average of $9.30 a ton. During the month gold bullion shipped to the Royal Mint at Ottawa amounted to $2,314,829.

Red Lake Rush Still on

W. F. Baum, of Pittsburgh, Pa., a mining engineer, is reported in the press recently as having stated that the Canadian Government should stop the rush into Red Lake. He says that gold does not exist in Red Lake in paying quantities, as the veins do not assay more than $10 to $17 a ton. If Mr. Baum has been quoted correctly this is one of the biggest boosts the district has had, as such values are considerably in excess of the average of all the gold mines of the province.

Staking in the Red Lake district is still spreading, and 4,000 to 5,000 claims have been recorded. As soon as the break-up occurs, the Dome is to send in more drills with which to prospect the Red Lake Prospectors ground, which it has under option in addition to the Howey. First reports of the Howey drilling should soon be out, as the first drill started on April 14.

Kirkland Lake Cuts Vein on Two Deep Levels

The Kirkland Lake gold mine, Kirkland Lake, Ontario, has cut the vein at the 2,100 and 2,225 levels, at about 200 ft. from the shaft. Ore was encountered very close to the point anticipated. The dip of the ore below the 1,900 level is slightly to the south. It was dipping at an angle on the upper levels, but has straightened out and is now almost vertical.

The next stage of the development will be to open up the vein on the two lower levels. No further sinking will be done until more lateral work has been accomplished. An effort will be made to provide a sufficient tonnage of ore for the opening of the mill some time during the summer.

Western Chemical Producing 1,500 Tons Sodium Sulphate per Month

Western Chemicals, Inc., is mining 1,500 tons of sodium sulphate a month at its property near Camp Verde, Ariz. Until recently the property was operated as an underground mine, but the stopes and tunnels have now been abandoned and an open cut has been started with a gasoline shovel.

There is good demand for all the sodium sulphate the plant can produce, the entire output being taken by three purchasers. Experiments are now being made with the object of producing baking soda.

New Diamond Fields Discovered in South Africa—Combine Controls Prices of Gems

There was much interest in London recently in the news of the discovery of a new diamond field in South Africa. South Africa is diamond mad. There was a rush of 2,000 prospectors on April 9, to Swartplaats, near Wentersdorp, in the Transvaal. Pioneer prospectors had found $50,000 worth of diamonds, and the news of the discovery soon spread rapidly.

If this new diamond field had been discovered a year ago, it might have had an effect upon the price of diamonds. It is not expected in England to have any depressing effect upon prices, as on Jan. 1 all diamond producers of the world came together and formed a new "diamond combine," to stabilize and control the price.

At the head of this combine are the Barnato group, of London, and the Dunkelsbuhlers, of Germany. American interests are represented in the new combine by Charles Sabin and W. B. Thompson. There has never before been such complete unity and cooperation among the diamond producers of the world as exists under the present organization.

Mexico City Letter

By W. L. Vail

Special Correspondent

New Mining Law to Go Into Effect This Month—Labor Troubles at Jalisco

The most radical change expected in the new Mexican mining law which will go into effect in May, unless the President holds backs it promulgation, will relate to the enforced working of all claims. Paragraph 6 of Article 27 of the new Constitution provides for "regular work," whatever that may be construed to mean. Mining operators are anxiously awaiting the construction. By the official publication on Feb. 4, the President was given ninety days in which to put the new regulations in force. It was understood that the government would invite suggestions from the mining chambers, but at this writing officials of those bodies are still in the dark as to exactly what the department intends to put out. The proposed regulations would substitute for the present system of denouncements, the necessity of doing "work" previous to receiving title; also the government proposes to enter into partnership or participation, and those details would have to be worked out before title is issued.

It is understood that this new law will not be retroactive in any sense and that present titles will be respected.

Labor troubles at Cinco Minas, in Jalisco (Marcus Daly interests) are reaching a climax by the appearance in this city of George Zoffman, manager, who has been in consultation with the American Ambassador, presumably, according to local papers, for the purpose of securing diplomatic assistance. The differences were decided by the lower courts of Jalisco in favor of the company, but the labor unions refused to accept the findings, and the mills have been closed for some time. Recently federal troops were placed in charge to prevent possible damage to the plant. As the entire matter is now before the Supreme Court, probability of diplomatic interference is remote.

Reports from Oaxaca state that the Majestic Mining Co. is erecting a new 50-ton mill, which will increase the capacity to 75 tons daily. The company is also completing an automobile road to Totoloapam, nearest railway head to the camp, about 35 miles distant. It is reported that a corps of engineers of the American Smelting & Refining Co. has recently made a number of denouncements in the same district.

Mining taxes received by the Federal Government are approaching the million mark rapidly. The government hopes to increase materially the income from mines under the new regulations.

Lake Shore Mills 500 Tons Per Day

The mill of the Lake Shore mine, Kirkland Lake, Ontario, is handling 500 tons per day. It is understood that this rate can be maintained on ore yielding an average of about $16 per ton.

London Letter

By W. A. Doman
Special Correspondent

Bwana M'Kubwa Mill to Start Soon—Panama Corporation Shares Oversubscribed

London, April 20—For some time shareholders in Bwana M'Kubwa have watched the decline in the price of the shares rather anxiously, and the fact that some of the large holding companies have been selling has not contributed to confidence. The delay in the starting of the new plant is now over, and a cablegram has been received from the mine, signed by two directors and the manager, stating that power plant and permanent pumping plant are completed and are running satisfactorily. The coarse and secondary crushing plants are about to be completed. As to the leaching and evaporating plant, about 95 per cent has been completed, but a full run cannot be undertaken before the arrival of the remainder of the plant early next month. The consulting engineer also cables that the mine position is excellent and that practically 200,000 tons of broken ore are ready for the plant. The first unit of the plant is designed to treat 1,000 tons of ore daily, for an output at the rate of 10,000 tons of copper per annum.

The Gaika-Globe and Phoenix controversy has broken out afresh. The directors of the last-named company are of the opinion that someone connected with Gaika-Globe has attempted to depress the price of the shares, and the chairman of that company states that he has had nothing to do with the matter. At the recent meeting of the Globe and Phoenix, the chairman remarked that there was plenty of life in the mine yet, and that it had always been full of surprises. This is quite true, but unless further ore is opened up it is not easy to see where future dividends are to come from. A year ago it was officially stated that the mine would not be exhausted within the lifetime of the present shareholders. It seems, however, to be working on a narrow margin, as available ore reserves are sufficient for about twelve months only. It might almost be suspected that there have been dissensions on the board, for one of the most prominent directors, connected with the company something like fifteen years, has been requested to resign.

Dealings have begun in the shares of the recently floated Panama Corporation. Though the issue was oversubscribed, there does not seem to be a keen desire to keep the shares. They are paid to the extent of 10s. and are quoted at a discount of 1s. 9d. The vendors, who receive 1,000,000 shares, can make a handsome profit by selling at a much lower price than this.

Amalgamation of Tin Properties

The Nigerian Base Metals Co. has sent an expert to Nigeria to investigate the various processes used to remove overburdens and recover the alluvial concentrates. When the problem is solved, a plant will be dispatched for dealing with ground on a large scale.

Although the price of tin fluctuates considerably, it is at such a high level that almost any company can work at a profit. I understand a plan is on foot for the amalgamation of the property of the Ranga Tin Syndicate and the Obbuassi Syndicate in Southwest Africa. The former needs more capital, and so an arrangement is being made by which the latter will purchase the Ranga property for shares. Trewartha James is on his way to Southwest Africa again, and is expected to reach his destination before the end of the month. The Southwest Africa Co. has pegged off a large area of alluvial tin along the Omaruru River, and will start work soon.

Peñoles Mining Co. Secures Option on Presidio Company

An option to purchase the silver mine of the Presidio Mining Co., at Shafter, Tex., has been secured by the Peñoles Mining Co. of New York, which owns extensive mining and smelting properties in the Mapimi and Torreon districts of Mexico. Under the terms of the option the company takes over the mine under a working arrangement for three years.

The Presidio Mining Co. was formed about forty-five years ago, and since the beginning of operations has been a steady producer of silver ore, the total production being more than $20,000,000. The company's holdings embrace 1,280 acres of land purchased from the State of Texas. No effort has been made to develop other mineral wealth that the land may contain. It is stated, however, that the Peñoles company plans to do extensive prospecting.

In connection with the taking over of the Shafter silver mine, information has been received here of the discovery of the entrance of a shaft of a "lost" mine in this section. This mine is just off the Fort Davis road, 15 miles from Alpine. Workmen are removing tons of rocks with which Indians of a century ago concealed it. There are a number of legends of lost mines in the Big Bend section, but this is the only one that gives appearance of proving an actuality. Adrian Murray is superintendent of the work at the "lost" mine.

El Recuerdo Mine to Install Hoist

North America Lead Corporation's El Recuerdo mine, at Vincente Guerrero, Durango, Mexico, has contracted to sink and timber the shaft 100 ft. deeper to the 400 level.

The mine is now hoisting with a *malacata* over which the new headframe is being installed. To change from the *malacata* to the new hoist will entail a suspension of hoisting operations for only a short time.

While sinking the shaft, the new hoist, which has been ordered, will enable the mine to take out three cars a week for shipment. Seventy cars of ore have been taken out since Feb. 1, that assay from 17½ to 19½ per cent lead and 12 oz. of silver per ton.

Johannesburg Letter

By John Watson
Special Correspondent

South African Mineral Production Shows Slight Gain—Costs Also Increase—Platinum Discussed at Geologists' Meeting

Johannesburg, March 30 — Statistics issued by the Government Mining Engineer on March 26 show that the value of the mineral production of the Union for January and February totals £8,841,690, which is an increase of £7,212 compared with the corresponding two months of last year.

According to the Government Mining Engineer's return, the total expenditure by the gold-mining industry last year, on salaries, wages, and stores, amounted to £27,595,419. This is an increase of £42,600 over the total for the previous year, the increase being due to higher wage payments. The stores purchased showed a saving of over £12,000. In 1925, salaries and wages to white employees totaled £7,502,848, the largest figure since 1921 and nearly £180,000 more than in 1924. The value of stores consumed last year was £13,766,387 for the gold mines; whereas the whole mining industry of the Union consumed stores equal in value to £16,117,165. Of this total, South African products consumed were valued at £9,920,043, the balance of £6,197,092 being imported.

Dr. Percy A. Wagner, senior geologist of the Union Geological Survey, gave an interesting address on platinum at the weekly luncheon of the Pretoria Rotary Club on March 25. The true home of the "noble" platinum metals is deep down in the earth's core, so that when these metals are found at or near the earth's surface, it was the result of an accident. Fortunately for us, such accidents have occurred in the geological history of South Africa, and, in consequence, we possess incomparably the world's greatest platinum deposits. The chief South African sources are: (1) the gold-bearing conglomerates of the Rand; (2) the lode deposits of the Waterburg district; (3) the magnetic deposits of the Bushveld igneous complex. Under the first heading, it would be news to many to know that, in 1925, there had been recovered on the Rand platinoid metals to the value of over £170,000, chiefly osmiridium concentrates, but containing notable amounts of platinum and ruthenium. In the Bushveld igneous complex the deposits were of three main types: (1) hortonolite dunite; (2) chromotype deposit; (3) deposits in which platinum was combined with magmatic nickel-copper-iron sulphide. The last were the most important, as they included the Merensky horizon in the Lydenburg, Potgietersrust and Rustenburg districts. In the next few years the South African platinum producers will probably put to the test the question as to how much platinum the world can absorb. When the best method of recovery has been decided on, huge plants capable of producing 200,000 oz. of platinoids per annum will be erected without delay.

People You Should Know About

H. M. Kingsbury sailed from New York on April 28 on the "Mauretania," en route to South Africa.

L. F. Strobel, of New York, has gone to Denver, where he will be engaged in matters involving mining interests in Cripple Creek.

Bennett R. Bates, manager of the export division of the Dorr Company, returned last week from an extended trip through Mexico.

George Harbordt, vice-president and general manager of Cia Minera de Peñoles, Monterey, Mexico, is in New York for two weeks.

T. Wolfson, president of the Metal Sales Corporation, has sailed for Brussels in the interests of the Copper Export Association.

E. K. Higgins, formerly acting engineer for the Berta Mining Co., has informed *Engineering and Mining Journal-Press* that he is no longer associated with the Berta company.

Julia Gardner, of the Geologic Branch of the U. S. Geological Survey, sailed on April 30 for Spain, by way of Paris, to attend the meetings of the International Geological Congress at Madrid.

A. W. Allen returned to Antofagasta in April after a visit to the copper and manganese-silver properties of the Poderosa Mining Co. at Collahuasi, near the Chile-Bolivia frontier. After a short stay in Antofagasta he left for the nitrate pampa.

Professors R. C. Beckstrom and **P. F. Shannon** and eleven juniors in petroleum engineering from the Colorado School of Mines, Golden, Colo., were in Houston recently while on a tour of inspection of oil fields and refineries in the surrounding Gulf Coastal district.

R. P. Tears, formerly of the Noranda Mines, Quebec, has been appointed superintendent of the Grace Gold Mine, at Eagle Lake, in the Kenora district of northern Ontario, which has been recently acquired by the United Mine & Power Syndicate of Montreal, and is being reopened.

Walter Hovey Hill, of Boise, Idaho, has been spending some time in New York City, and during the course of his visit attended the complimentary dinner given to John Hays Hammond, on May 3, an account of which appears on page 780 of this issue of *Engineering and Mining Journal-Press.*

Professor Allan E. Sedgwick, head of the department of geology of the University of Southern California, has been conducting groups of students of the university through the oil fields of Santa Paula and Comirillo and other geologically important and interesting regions of the Southwest.

W. B. Cramer, of Warren, Ariz., consulting engineer for the Phelps Dodge Corporation, gave two lectures before engineering and chemistry students of the University of Arizona on April 27. The subjects of the lectures were "Concentration" and "Chemical Warfare." Mr. Cramer is the ranking reserve officer for chemical warfare in Arizona.

M. H. Gidel, geologist for the Anaconda Copper Mining Co. has returned to Butte, after spending nearly five months at the Geisches Erben zinc mines, on the border between Germany and Poland. It is expected that Mr. Gidel will relate some of his experiences in foreign parts at the May meeting of the Montana Society of Engineers.

J. J. Jakosky, research engineer for the Western Precipitation Co., recently returned to Los Angeles from an extended Eastern trip in connection with studies on the elimination of radio interference. Radio interference-correction equipment was installed at the Alpha Portland Cement Co.'s plant at Cementon, N. Y., which completely eliminates all local radio interference from the Cottrell precipitator installation.

Dick Wick Hall

Dr. Ing. E. Münker, of the board of directors of the Mansfeld A.-G. für Bergbau und Hüttenbetrieb, Eisleben, and **Dr. Ing. Otto Barth,** works superintendent of the Hettstedt plant of the same company, embarked last week for Germany after a four weeks' inspection trip in the United States, in which they visited the smelters and refineries in the vicinity of New York and some of the mines, mill's, and smelters in Utah. They were tendered a farewell luncheon by a few members of the A.I.M.E. on the day they sailed.

Obituary

Oliver Durant, a pioneer mining man in the Coeur d'Alene and Kootenay districts died at Washington, D. C., on April 17 at the age of eighty. Mr. Durant developed the Centre Star mine, at Rossland, B. C., from a prospect and sold it to Eastern Canadians for $2,000,000. He was associated with Senator W. A. Clark in several ventures in the Coeur d'Alene.

Dick Wick Hall, of Salome, Ariz., died in Los Angeles on April 29. Hall had been a newspaper man, miner, and real-estate dealer in Arizona for twenty-six years. He became well known some years ago through the publication of his humorous column, "The Salome Sun," which had been started by him as a small mimeograph sheet to advertise a new Arizona highway. Hall was born in Creston, Iowa, March 20, 1877, and attended public schools and the University of Nebraska. After leaving the university he engaged in mining, farming, and the development of oil properties. He founded in 1905 the settlement now known as Salome, choosing as its site a fertile valley that he had discovered in Arizona. The town is well known to motorists traveling between Los Angeles and Phœnix. His column, "The Salome Sun," has appeared in many magazines. He also wrote short stories in the same characteristic colloquialisms that first attracted attention to his writings. Mr. Hall was a brother of Ernst R. Hall, a former Secretary of State of Arizona.

John Lawrence Malm, formerly of Cleveland, Ohio, died at Denver, Colo., on April 25. He was born Oct. 2, 1875, at Titusville, Pa. Mr. Malm was a mining and metallurgical engineer and received his education at Central High School and Case School of Applied Science. His first engineering practice was with the Corrigan-McKinney Co. in the Iron Belt district, Michigan, in the development of iron-ore deposits. Later he developed an improved process for the recovery of gold and spent considerable time in the cyanidation of silver and gold ores at Zacatecas, Mexico, for Eastern interests. During the last twenty years his work was confined to the treatment of the zinciferous ores of the West and the development of the Malm dry-chlorination process for the treatment of low-grade ores. He was prominent in the civic affairs of the City of Denver and chairman of the Community Fund Campaign. Much of his time was spent in Boy Scout work, in which he was deeply interested. He is survived by his window, a daughter and six sons.

William Donald Burton, geologist, died in Samne, Peru, on March 16. Mr. Burton graduated from the University of British Columbia in 1923 and shortly thereafter was employed by the Premier Gold Mining Co., Ltd., as assistant geologist under the direction of A. H. Means, and later became geologist. During the winter of 1924-1925 he pursued graduate studies with distinction at the Massachusetts Institute of Technology, receiving the degree of master of science in geology. A part of the summer of 1925 was spent in field work in eastern Canada with the Canadian Geological Survey, and in the fall of the same year he went to Peru as assistant geologist and scouting engineer for the Northern Peru Mining & Smelting Co. It was on a field trip in Peru that he contracted the illness which proved fatal. His first and last contribution to geologic literature consists of a paper describing the Premier ore deposits. This article is to appear in an early issue of *Economic Geology.* In Mr. Burton's death the mining industry loses a young man who at the outset of his career showed great promise and one who, had he lived, would have gone far.

Societies, Addresses, and Reports

Friends Honor John Hays Hammond

Noted Mining Engineer Is Guest of Honor at Birthday Dinner at the Waldorf—Many Tributes from Distinguished Men—Affair a Brilliant Function

TRIBUTES from a host of friends, including many notable personages in this country and abroad, were paid to John Hays Hammond at a birthday dinner tendered him at the Waldorf-Astoria in New York on May 3. It was his seventy-first birthday that was celebrated, a day that fell on March 31, according to the calendar, when Mr. Hammond was in Europe. Upon his return a week or so before, a delegation of his friends had met him at the "Olympic's" dock and made known to him the plans to honor him and had invited him to come. Herbert Wall, secretary of the Rocky Mountain Club, was the activating spirit of the movement.

On the committee of arrangements were many prominent citizens, among them John J. Carty, Chauncey Depew, Coleman du Pont, Arthur S. Dwight, Charles Dana Gibson, Simon Guggenheim, Arthur Twining Hadley, D. C. Jackling, George F. Kunz, James H. McGraw, Charles F. Rand, George Otis Smith, J. E. Spurr, and William Howard Taft.

In the Grand Ballroom of the Waldorf, the scene of many a brilliant function, the occasion found a proper setting. Besides those who came in person many notables were there in spirit through the medium of telegrams and cables—and beyond all these was the radio audience, invisible but interested.

Hammond an Internationalist

Charles S. Thomas, former United States Senator from Colorado, who on many other occasions had achieved renown for his ability as toastmaster, presided in this capacity. Before introducing the first speaker he spoke briefly of Mr. Hammond. He had largely revolutionized mining conditions in the United States and the rest of the world, the Senator said. Today he was first among all engineers of this country and of the world—a publicist, historian, pioneer, capitalist, and statesman. He was an internationalist in the best sense of the term. He had developed the wealth and resources of other countries, but had stood the test of nationalism and Americanism. He had heard of him, said Senator Thomas, as a follower of Cecil Rhodes, but he could not think of him as such, but rather as an associate, pointing out to the great empire builder the vast opportunities for development that existed in the early South African state. The speaker thought of them as almost indispensable adjuncts of each other, each contributing to the development of what today is the Union of South Africa.

Senator Thomas then introduced Arthur Twining Hadley, president emeritus of Yale, and a classmate of Mr. Hammond's long ago. Fifty-five years ago, said Dr. Hadley, Hammond, a California boy, had sat with him in classes in prep school and soon had won the regard of his instructors for the outstanding qualities which he displayed. Together they went through college, save that Hammond completed his course in three years, whereas he had taken the four. He then went to Berlin and Hammond to Freiburg. There Hammond got far ahead of him, for in Freiburg he found that lady who now presides over his hearth and home. Hammond was a man, he said, who translated his discoveries into action, as he had demonstrated on that occasion. Although now seventy-one years of age, he still had many years of good working activity remaining.

Advice to "Young Jack"

Following the remarks of Dr. Hadley, Senator Thomas took the floor again. Jack Hammond had friends in all parts of the world, he said, including the President of the United States and his Cabinet. One of his friends was the Secretary of Labor, Mr. Davis, who was seated at the speakers' table. Before introducing Mr. Davis, the Senator addressed the younger John Hays Hammond, who was present, saying, "Young Jack, take note of what they say about your father, and go and do likewise, and when you are seventy-one they will give you a birthday party too."

Secretary Davis, then speaking, said that he had known the guest of honor for twenty-five years. He told of an institution for the education and training of children, in the founding of which Mr. Hammond had played an important part. He was present, he said, to express the thanks of the 2,000 children who had graduated from that institution for the aid that they had received through Mr. Hammond's efforts.

A Broad Thinker—Never Narrow

Following the Secretary, Dr. Alexander C. Humphreys, president of Stevens Institute of Technology, spoke. He came, he said, to honor a man among men, tried under many conditions, and able to meet them honorably and successfully. Mr. Hammond was one of the few to receive the degree of Doctor of Engineering from Stevens Institute, he said. Mining had become his specialty, but not a narrow specialty. As an engineer Dr. Hammond was wont to consider his problems as a whole, with the financial result always in the background. The speaker quoted from an address once delivered by Mr. Hammond on engineering education, saying that he agreed with his statements as a whole. Narrow specialization, Dr. Humphreys said, in his belief was not for young people. They did not know, and could not possibly know, in what they ought to specialize. In concluding, President Humphreys said that he was grateful to Dr. Hammond for the inspiration that his life had been to him.

The toastmaster then introduced Key Pittman, Senator from Nevada. Drawing a comparison between the Senator and Mr. Hammond, he said that it was to Alaska instead of Germany that the Senator had gone to find *his* treasure, and that ever since then he had had the courage of his wife's convictions.

The Very Spirit of Metalism

Arising, Senator Pittman retorted that he doubted if anyone would be standing there tonight were it not for his wife. Turning to his subject, he sketched briefly the benefit that metals had given mankind. In the beginning, he said, man had been a weak animal, but the discovery of metals had made him dominant. He outlined how civilization had developed with the discovery of metals and with the widening of their use. Metals, he said, were the foundation of the prosperity of nations. Following the Civil War it was the discovery of the Comstock lode and its 600-odd millions that had brought prosperity to this country and averted the financial troubles that might otherwise have seriously figured in the aftermath of that internal struggle. Since the Great War, he said, we had found out that nothing but solid metal, such as gold and silver, was the foundation of credit throughout the world. He referred indirectly to the way in which a desperate situation in India had been bolstered up by the flood of silver from this country that was released from the Treasury of the United States through the enactment of the law that bears the speaker's name. "Jack Hammond," he said, represented the very spirit of metalism which inspired the prospector and the mining engineer.

A Great Soldier of Fortune

Colonel Henry D. Lindsley, the next speaker, came as representative of that great body of Army and Navy men, he said, to pay tribute to the distinguished American who was the guest of honor. The war was won by two great bodies, the Army and Navy, he declared. They did their part. That part, however, would have been impossible had there not been in the United States an army of men and women no less devoted than those who wore the uniform. It was absurd to say that a million men would spring to arms overnight were this country attacked, he said, but it was not absurd to say that no country, however great its resources, could succeed were there not a spirit of service. In that war, the speaker said, there was no man who set a more inspiring example than John Hays Hammond. As president of the Rocky Mountain Club he again and again had touched the conscience of the United States. He thought of him, the speaker said, as a great engineer, a great business man, and as a great soldier of fortune. No mountains were too high, he said, for him to cross in seeking opportunity. He exemplified that spirit of the true soldier of fortune which the United States as a nation so well exemplified.

In introducing the next speaker, James W. Bryan, of the National Press Club, Senator Thomas jocularly said that no matter how eminent a man might be, he needed an outside agency at times to avoid having his achievements escape attention. He said that there was a suspicion that Mr. Hammond had had a press agent at least once during his career. Thereupon the toastmaster introduced Mr. Bryan.

Mr. Bryan said that at the seventy-first milestone of his career those present had gathered to wish godspeed to John Hays Hammond, of California, Washington, and the world. Speaking as a newspaper man, he said, for a long time "John Hays Hammond" had meant awfully good copy to him and the other newspaper men in Washington. It was just about a year ago that he had come to know the real John Hays Hammond. In Washington, he said, where the "stuffed shirt and the high hat" played such a great part in public life, he had had opportunity to meet in Mr. Hammond a great man who did not pose. Despite the fact that he was responsible for more wealth than any other man had produced, Mr. Hammond was still seeking treasure, the speaker said, the gold of humanity. "Is there ore in this vein of thought?" he pictured Mr. Hammond as questioning, in seeking those things that make the world a more fit place to live in. Mr. Hammond's one thought, he said, was that any good found might be developed by the fittest machinery to benefit the greatest number. They were now building in Washington the National Press Club, a $10,000,000 building, and it was owing to John Hays Hammond, he said, that the venture would be a successful and thoroughly practical one.

Eminent Citizen of the World

The next speaker, said the toastmaster, was also a Washington institution. It was the Rev. James E. Freeman, Episcopal Bishop of Washington and rector of Mr. and Mrs. Hammond. Bishop Freeman referred to the last words of Cecil Rhodes: "So much to do, so little done." He thought, he said, that Mr. Hammond could hardly echo such a sentence. The accumulation of friends such as he possessed was a consummation devoutly to be wished. The Bishop paid a tribute to Mrs. Hammond. John Hays Hammond had had a friend, he said, who had been one of the contributing factors to his greatness and genius—his wife. If he should write his story, the Bishop said, Mr. Hammond would give to her a very conspicuous place. In that very tragic incident (connected with the Jameson raid) which so nearly had terminated Mr. Hammond's life, it was Mrs. Hammond, he said, who, when hope had practically been given up, rallied the influential friends of Mr. Hammond in many countries and brought such pressure of opinion to bear that the Boer leaders changed their minds. It might not be generally known, said the Bishop in conclusion, that Mr. Hammond's latest distinction was that of being a cathedral builder. He paid tribute to him as an eminent citizen of the United States. We might boast, he said, of being the creditor nation of the world, of our huge store of gold. The great test, however, of a nation was in its citizens, and it was to John Hays Hammond as a citizen that he lifted his hat—a great citizen of a very great republic.

Mr. Hammond: The Value of Friendship

The guest of honor, Mr. Hammond himself, was then introduced. Mr. Hammond said that he should feel that he was lacking in the finer instincts if he were not overcome at such a demonstration. He felt more helpless than ever to try to express his gratitude. He had no idea that it would be such an occasion, but he had reckoned without the ability and organizing genius of Herbert Wall, secretary of the Rocky Mountain Club, who had organized the dinner. He said that he had declined to admit that threescore years and ten had any terrors for him. He did not aspire to be a centenarian. When congratulating Chauncey Depew, that dean of well-preserved faculties, as he aptly called him, he had told him that he felt considerably like a "piker." The real business of life, he said, was to build up and maintain human contacts, and so long as one had done this, he had not failed. He recalled the crisis referred to when he had stood in imminent danger. His friends had come to the rescue, seconded by the efforts of his devoted wife, and to their tireless energy he owed his life. No wealth ever came out of a mine comparable to the friendship that made life worth living. Life was not to be regarded as a series of pleasure-giving incidents nor as a chance to play a good hand, but rather as an opportunity to play a bad hand well. He quoted Shaw to the effect that the real joy of life was in being used by a mighty purpose, realizing that it was a mighty one. He had a sense of solemn pride, he said, as he looked about the banquet room, and saw so many men that called him friend. He thanked God that he had lived and toiled with men.

Thousands of messages paying tribute to Mr. Hammond were received, only a few of which were read. Congratulations were sent by President Coolidge. Chief Justice Taft expressed an admiration based on fifty years of close association. All these testimonials from his friends, expressing to him their good wishes and esteem, were presented to the guest of honor. At the dinner's close they were still arriving. Later, it was announced, they are to be engrossed and bound in several volumes. With this the evening ended, in all a memorable occasion.

Two Meetings in South Africa

The monthly meeting of the Chemical Metallurgical and Mining Society of South Africa was held in Johannesburg on March 20. An exhibition of platiniferous ore and platinum products from the Lydenburg district was shown and described by R. A. Cooper by permission of the directors of the Central Mining Rezende-Rand Mines group.

The annual meeting of the Geological Society of South Africa was held in Johannesburg on March 15. The election of officers resulted in Prof. R. B. Young being elected president for the second time.

Moctezuma Led Other Branches in Safety Work

Standing Revealed at Quarterly Meeting of General Safety Committee of Phelps Dodge Corporation at Nacozari

The completed records covering the safety-first program of the various branches of the Phelps Dodge Corporation for the year 1925 showed that the Moctezuma Copper Co. had the lowest number of lost-time accidents per thousand shifts worked of any of the branches. The Copper Queen Branch, the Old Dominion Co., and the Morenci Branch, followed in the order mentioned. These facts were revealed at the recent quarterly meeting of the General Safety Committee held at Nacozari, Mexico.

The plan of safety organization put into effect last year throughout the different branches of the corporation has proved very successful, all branches having made marked reductions in the number of accidents. The safety organization includes the general manager of the corporation, managers, assistant managers, general superintendents of the different branches, and the heads of departments, who in turn have workmen's safety committees for all divisions of the mines, mills, shops, and other working places. The general committee consists of the following:

P. G. Beckett, vice-president and general manager of the corporation; G. H. Dowell, manager of Copper Queen Branch; H. C. Henrie, manager of labor department, Copper Queen Branch; W. G. McBride, general manager of Old Dominion Co.; W. N. Saben, assistant manager of Morenci Branch; and Frank Ayer, manager of the Moctezuma Copper Co.

Each branch committee chairman outlined the safety plans and methods which had given best results at his branch and the measures taken to prevent recurrences. A review of accident statistics of each branch, classified as to cause, was also made, and a definite program decided upon for avoiding accidents in the classes showing the highest rates. In general it was found that the different properties had exercised every precaution and care to guard dangerous places and machinery, and that the greatest field for further improvement was in instruction, or "putting the safety idea over" to the men, and in strict discipline.

It was announced that in 1926 a Phelps Dodge Corporation Safety Trophy will be awarded to the branch having the lowest number of lost-time accidents per thousand shifts. The winning branch will be allowed to keep it one year—or until some other branch has a lower year's safety record. In addition to this safety trophy, the corporation will present departmental banners, which will be kept permanently by that department having the lowest percentage of lost-time accidents for a year. For example, the concentrating department of that branch having the lowest percentage of lost-time accidents of any of the various concentrating departments of the corporation for the year 1926 will be awarded the banner for that year, to be retained by it permanently.

Recent Technical Publications

Reviews, Abstracts, and References

The Metric System. Compiled by Julia E. Johnsen. Vol. 3, No. 8 of "The Reference Shelf." The H. W. Wilson Co., New York City. Price 90c.
This is a compilation of published articles on the metric system, including a bibliography for reference, and a brief for debaters who wish to argue the general adoption of the system. A good reference book for those who wish to know the pros and cons of the subject.

The April issue of the *Congressional Digest* (Munsey Building, Washington, D. C.; price 50c.) also contains several articles on the general subject "Should the United States Adopt the Metric System for General Use?" giving arguments both pro and con.

Refractories—The various grades of refractory materials and their proper uses are discussed by Edmund R. Thews in an article appearing in the Feb. 25 and March 11 issues of *Iron Trade Review* (Cleveland, Ohio; price 25c. each), entitled "Selecting Refractories for Use in Metallurgical Furnaces."

Nova Scotia Mining—The "Report on Mines" for 1925 has been published by the Department of Public Works and Mines, Halifax, N. S., and is obtainable on request. Coal mining is the chief industry, though some gypsum is mined and a little salt and gold. The present condition of many companies and prospects is given.

Indian Mining—"The Mineral Production of India During 1924" and "Quinquennial Review of the Mineral Production of India for the Years 1919 to 1923," both by L. L. Fermor, have recently been published by the Geological Survey of India, Calcutta, from which they may be obtained on request. The total value of the mineral output in 1924 amounted to £28,626,598, compared with £24,986,392 in 1923. The principal minerals, in the order of the value of their production, are: coal, petroleum, manganese, gold, lead, silver, building materials, salt, and mica.

Institution M. & M.—A list of members of the Institution of Mining and Metallurgy, together with the constitution and by-laws, has recently been issue by the organization, whose address is Cleveland House, 225 City Road, London, E. C. 1.

South African Mining—The annual year book and directory of *The South African Mining and Engineering Journal* has recently been published, under the editorship of S. R. Potter. It fully lives up to its reputation of being the best annual review of the mining and engineering industries of South Africa that is obtainable. In addition to such technical and economic data as are usually published in year books, a large amount of data on individual companies is given, and, in addition, much information of interest to manufacturers and purchasing agents. Copies are obtainable for 12s., postpaid, from Argus South African Newspapers, Ltd., 72-78 Fleet St., London, E. C. 4, England.

Aspen, Colorado—It has now been thirty-one years since a geologic study of the Aspen district, in Colorado, was made by J. E. Spurr; a study that was made the basis of a well-known geologic monograph, No. 31, issued by the U. S. Geological Survey in 1898. Many compliments are paid to this work by Adolph Knopf in U. S. Geological Survey Bulletin 785-A, "Recent Developments in the Aspen District, Colorado," pp. 28, obtainable on request from the Survey, at Washington, D. C. The present bulletin is devoted to the southward extension of the district covered in the former monograph; it is illustrated with a colored geologic map and several sketches. The orebodies of the Aspen district are silver-bearing lead deposits formed mainly through the replacement of limestone.

South African Platinum—The *Mining and Industrial Magazine* of Southern Africa (Johannesburg; price 6d. each issue) has recently been publishing many articles regarding the platinum industry and the developments in the newly discovered platinum fields of that continent. Among them is one entitled "Future of Platinum Industry," in which the author says that he thinks a heavy decline in price is in prospect as the South African production comes on to the market in volume. The names and brief details regarding the principal companies are also given in this article, which appeared in the Feb. 24 issue.

Mineral Resources—Recent publications of the U. S. Bureau of Mines in the "Mineral Resources in 1924" series include: "Secondary Metals," by J. P. Dunlop, pp. 20; "Lead," by C. E. Siebenthal and A. Stoll, pp. 16; "Antimony," by Frank C. Schrader, pp. 14; "Silica," by Frank J. Katz, pp. 4; "Fuel Briquets," by W. F. McKenney, pp. 6; and "Gypsum," by K. W. Cottrell, pp. 10. These discuss production and consumption data and also contain more or less technical and economic information. Copies are obtainable for 5c. each from the Superintendent of Documents, Washington, D. C.

Gas Data—Circular of the U. S. Bureau of Standards, No. 279, pp. 85, is entitled "Relations Between the Temperatures, Pressures, and Densities of Gases." Formulas are derived and experimental data are presented in numerous graphs and tables. A rather extensive bibliography is included. Copies are obtainable for 25c. each from the Superintendent of Documents, Washington, D. C.

Canadian Mines—The March 26 issue of *The Canadian Mining Journal* (Gardenvale, Que.; price 15c.) is called a "Progress Number," and gives a review of developments in the Dominion's mining industries during the last year. A particularly valuable feature is a directory of all Canadian mining companies, with the names of officials and particulars regarding the operation of most of the more important companies.

Australian Mining—The Annual Progress Report of the Geological Survey for 1924, for Western Australia, is now available (Perth). Among other regions discussed is a description of the recent discoveries and developments at the north end of Kalgoorlie, where refractory gold ores are found.

The year book of the Commonwealth of Australia is not obtainable in New York as mentioned in a recent issue of the *Engineering and Mining Journal-Press*, but presumably may be obtained from the Commonwealth Statistician, Melbourne.

Idaho Antimony and Quicksilver—Bulletin 780-D of the U. S. Geological Survey, Washington, D. C., pp. 28, obtainable on request, is a discussion of the "Antimony and Quicksilver Deposits in the Yellow Pine District, Idaho," by Frank C. Schrader and Clyde P. Ross. The geology of the district is covered briefly and the various mines and prospects are described in the light of what had been done up to a year or two ago.

Surveying Boreholes—The February issue of the *Bulletin* of the Institution of Mining and Metallurgy, Cleveland House, 225 City Road, London, E. C. 1, England, contains 11 pages of discussion on "A New Instrument for Surveying Boreholes."

Fireclay Brick—A bulletin entitled "Fire-clay Brick; Their Manufacture, Properties, Uses, and Specifications," has recently been published as Circular No. 282 of the Bureau of Standards, pp. 50, obtainable for 25c. from the Superintendent of Documents, Washington, D. C. The geology, classification, and characteristic properties of fireclays are discussed briefly, as well as the topics mentioned in the title. A bibliography is appended.

Blasting Heavy Sulphides—"Gases From Blasting in Heavy Sulphides" is discussed by E. D. Gardner, G. W. Jones, and J. D. Sullivan in U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,739, pp. 8, obtainable on request to the Bureau at Washington, D. C.

Gypsum Products—Circular No. 281 of the U. S. Bureau of Standards is on "The Technology of the Manufacture of Gypsum Products." A description is given of mines from which the raw material is obtained, and of methods of working them. Types of calciners are described, with the efficiencies of each, and the processes through which the material passes, with the machinery employed, are discussed. The bulletin also contains much information on the manufacture of gypsum wall and plaster board and gypsum tile, and several representative mills are described in an appendix. Copies are obtainable for 30c. each from the Superintendent of Documents, Washington, D. C.

Precious Metal Analysis—"Analysis of Copper-palladium-gold-silver Concentrates" is discussed by C. W. Davis in U. S. Bureau of Mines *Reports of Investigations*, No. 2,731, pp. 5, obtainable on request from the Bureau at Washington, D. C. The best method of assay, as determined by experiment, is described.

New Machinery and Inventions

Semi-automatic Control Applied to Large Hoist

Mountain Consolidated Shaft Installation Designed for Rope Pull of 56,800 lb., and to Wind From 5,200 ft. at Maximum Speed of 2,250 ft. Per Minute

THE Anaconda Copper Mining Co. recently placed the initial order for large electric hoists for three of its Butte mines. The company's plans contemplate that in the near future a total of ten mines will be equipped with similar large electric hoists. The present installation at each mine will consist of a double-drum ore hoist with direct-connected motor supplied from a synchronous motor-generator set, together with a single-drum chippy hoist with direct-connected motor, also supplied from a synchronous motor-generator set. The General Electric-Nordberg equipment to be furnished for two of the shafts was described in the March 6 issue, p. 423.

The Allis-Chalmers Manufacturing Co., in connection with this project, is building what is, so far as physical size goes, the largest double-drum electric hoist with direct-connected motor ever constructed by one manufacturer in this country. This is the double-drum ore hoist for the Mountain Consolidated shaft. The hoist will be designed for a maximum rope pull at the drum of 56,800 lb., and will operate at a maximum rope speed of 2,250 ft. per minute. The drums will be plate-steel design, 12 ft. diameter by 8 ft. face, arranged to wind 5,200 ft. of 1⅛-in. rope in three layers. Each drum will be driven by a powerful double-disk multiple arm 12-ft. clutch and served by a 15-ft. structural-steel, parallel-motion post brake. Each brake and clutch will be actuated by an individual oil-operated auxiliary engine. The two auxiliaries for each drum will be controlled by a single hand lever, mechanically interlocked, designed so that the brake must be set before the clutch can be disengaged, and likewise the clutch must be engaged before the brake can be released. This safety measure will eliminate the possibility of ever dropping a skip down the shaft.

A special point in the design of the drum, which it is claimed will tend to increase the life of the ropes, is that the width of the face will be kept as near as possible to 96 in., so that the second layer of rope starts back practically opposite the point longitudinally where the first turn of the first layer comes through the shell, all within the limits of commercial practice.

This double-drum hoist will be driven by a direct-connected, d.c. motor having a nominal rating of 2,000 hp. at 59½ revolutions and capable of handling peak loads of 4,500 hp. torque. The motor will receive power from a 1,600-kw. synchronous motor-generator set, especially designed for this service. The synchronous motor will be wound for 2,400-volt, 60 cycles, 3-phase current.

The chippy hoist for this mine will be of the single-drum unbalanced type designed for a maximum rope pull at the drum of 30,800 lb. and will operate at a maximum rope speed of 1,500 ft. per minute. The drum will be 96 in. in diameter by 100-in. face and will wind 5,200 ft. of 1⅜-in. rope in three layers. The same precaution in the design will be exercised as outlined above in regard to the ore hoist so as to have an exact number of turns of rope on the first layer on the drum. The drum will be built of plate steel, will be keyed to the drum shaft, and equipped with two 10-ft. dia. structural-steel, parallel-motion post brakes, interconnected through an equalizing device and operated by an auxiliary oil-operated brake engine. The chippy hoist will be driven by a 1,000-hp., 59½ r.p.m. direct-current motor, direct-connected to the drum shaft, and will receive power from an 800-kw. synchronous motor-generator set.

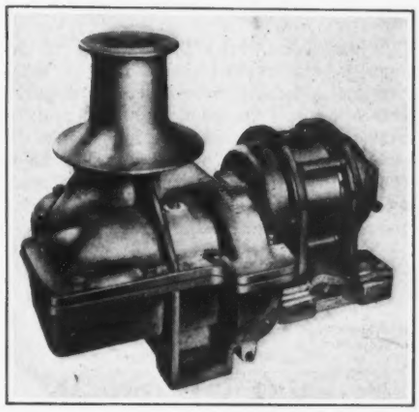
The auxiliary oil-operated brake and clutch engines of both hoists will be actuated by oil under pressure supplied from oil-pressure systems, one for each hoist. This system supersedes the old weighted-type accumulator. It is much more reliable and has no valves nor glands and makes a cleaner installation, as it eliminates all oil drip and seepage.

The hoist motors as well as the generators on the synchronous motor generator sets will be provided with "Frog-leg" windings developed and perfected by the Allis-Chalmers company. Control for both hoists will be of the variable voltage type, controlling the speed by varying the strength and direction of the field of the generators on the sets. Both hoists will be provided with complete safety devices, including the latest development in the art. The control system for the ore hoist described above will be especially interesting. This hoist will be designed for manual control by an operator on the platform, or for semi-automatic operation from three different underground levels. It will be so interlocked that it will be impossible to operate the hoist except from a single station at a time. When operating with semi-automatic control, the skip loader underground will start the hoist by means of a pull switch at the loading station. On closure of the pull switch the hoist will be accelerated to full speed and continue to travel at full speed until the dump is approached, where it will be automatically slowed down in successive steps to a very slow speed while the skip is passing through the dumping horns and brought to a complete stop at the limit of travel. At this point all power is cut off and the brakes are applied automatically. This will be the first time in this country that a hoist of this size, operating from a depth of 5,100 ft. and at this high rope speed, has been built for semi-automatic control. Naturally, many special problems have to be carefully worked out in so important an operation, it is said.

A Vertical-Capstan Car Spotter

A small, compact, motor-driven car puller, or "spotter," has been put on the market by the H. W. Caldwell & Son Co., 1700 S. Western Ave., Chicago, Ill. It is intended to reduce the time required for moving and spotting cars. The machine is also expected to be useful in moving materials in storage yards, foundries, or shops. The capstan has a full working radius of 360 deg., thus eliminating any relocating of the machine.

The car spotter is of rugged design,



This vertical-capstan car spotter is of rugged construction

with a heavy upper bearing to take the pressure from the rope pull. The capstan has a large flange on the lower end to reduce the bending moment of the shaft. The oiling system is automatic, and the gears operate in oil reservoirs. The machine is built in two sizes. The No. 1 size has a speed up to 60 ft. per minute, and will move up to three cars. The No. 2 machine is designed for a speed up to 42 ft. per minute and will move as many as six cars.

Plastic Cement and Gun

The Carborundum Co., of Niagara Falls, N. Y., has introduced a new refractory plastic cement, called "Carboplastic" cement, and a new cement gun for its application. The principal ingredient of the cement is carborundum. It is claimed that, by the use of a suitable bonding material, a cement is obtained having the refractory properties of carborundum and yet capable of being applied successfully by a gun. The cement-air "sets" with a strong bond and is more refractory than the best grade of firebrick. It is used for locally coating firebrick to protect against flame impingement, against cavities caused by cracking and spalling and against other causes for maintenance and repair. In this way it increases the life of furnace settings. It can be applied either hot or cold.

The gun is a portable type and weighs only 12 lb. It is controlled by a single valve and has no other movable parts. Steam or air at 100 lb. pressure is used to operate it. Capacity is about 100 lb. of cement per minute. It can suck the cement from an ordinary pail. Both the cement and the gun are handled by the refractory division of the company, located at Perth Amboy, N. J.

The Market Report

Activity in Metal Markets Confined to Silver, Lead, and Tin

Interest in Copper and Zinc at Lowest Ebb in Months, Though Prices Are Well Maintained

New York, May 5, 1926—With generally quiet conditions in the metal markets, lead can usually be depended upon to sell in good volume, and this has been true during the last week. Tin has also been in demand owing to the possibility of a shortage with English production closed down, while consumption here goes on unabated. Sales of copper and zinc have been almost non-existent, though there has been little pressure to force business, as improved markets are expected soon in copper and there is little or no profit for the zinc smelters with present prices of ore. Heavy Chinese and Indian purchases of silver have forced the prices for that metal sharply upward.

The general strike in England, called at midnight on Monday last, is the outstanding event of the week. The metal markets have not been adversely affected so far, though it is thought that if it continues over several weeks prices are likely to weaken. Tin is the exception, of course, for the reason above cited. Buyers of other metals in the United States have probably been inclined to postpone purchases, with the idea that declines are more likely to occur than advances under present conditions.

Average Metal Prices for April, 1926

Copper:	
New York Electrolytic	13.706
London Standard Spot	57.200
London Electrolytic Spot	64.600
Lead:	
New York	7.971
St. Louis	7.764
London Spot	28.775
London Forward	29.284
Silver:	
New York	64.409
London	29.682
Sterling exchange	485.702
Zinc:	
St. Louis	7.001
London Spot	32.503
London Forward	32.863
Tin:	
99 per cent	61.962
Straits	63.389
London	281.388
Quicksilver	89.769
Antimony	17.462
Platinum:	
Refined	111.538
Crude	103.731
Aluminum, 98 per cent	27.000

Daily Prices of Metals

April May	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
29	13.60	60.375	63.25	7.85	7.65@7.70	6.75
30	13.625	60.25	63.00	7.85	7.65	6.65@6.70
1	13.65	60.00	63.00	7.85	7.65	6.75@6.80
3	13.675	60.00	62.75	7.875	7.675	6.75@6.80
4	13.575	61.00	63.25	7.85	7.65	6.75@6.80
5	13.575	62.50	64.50	7.85	7.65	6.75@6.80
Av.	13.617	60.688	63.292	7.854	7.658	6.754

The prices correspond to the following quotations for copper delivered: April 29th 13.85c.; 30th, 13.875c.; May 1st, 13.90c.; 3rd, 13.925c.; 4th and 5th, 13.825c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

April May	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
29	57	57 3/4	64 1/2	275 1/4	267 3/4	28	28 5/8	32 5/16	32 9/16
30	57 1/8	58	64 1/2	274 1/4	266 1/2	27 7/8	28 1/2	31 7/8	32 3/16
3	56 7/8	57 3/4	64 1/2	268 3/4	264 1/2	28 3/16	28 11/16	31 7/8	32 1/4
4	56 5/8	57 1/2	64 1/4	268 1/4	264 1/2	28	28 1/2	31 3/4	32 1/8
5	56 1/2	57 3/8	64 1/4	272	266 3/4	27 15/16	28 7/16	32	32 5/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

April May	Sterling Exchange "Checks"	Silver		Gold London	May	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
29	4.85 3/4	64 3/8	29 3/4	84s 11 1/2d	3	4.85	64 5/8	29 15/16	84s 11 1/2d
30	4.85 3/4	64 5/8	29 15/16	84s 11 1/2d	4	4.84 7/8	65 3/8	30 5/16	84s 10d
1	4.85 5/8	64 3/4	30	.....	5	4.84 3/4	66 1/8	30 5/8	84s 10d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Copper Continues at 13 7/8c.

Although the week just passed has been comparable with Christmas week so far as volume of sales goes, sellers have been content to mark time and have almost without exception quoted 13 7/8c. for Eastern deliveries, and 14c. in the Middle West all week. Only two or three orders for as much as 500 tons each have been placed, and the small-order business has also been extremely light. The market was somewhat firmer on Thursday and Friday than it has been yesterday and today, as it has recently been possible to shade 13 7/8c. slightly in one or two directions, though apparently offers to buy at 13 3/4c. by a large electrical company met with no response.

With continued excellent consumption and three sucessive weeks of light buying, together with the favorable progress of the Copper Export Trading Association, and expected favorable statistics for April, sellers are optimis-

tic and in no mood to make concessions in price just now. A possible long-continued strike in Britain is the most unfavorable feature of the situation.

Foreign demand has been almost nonexistent, like the domestic demand, during the last week. Prices have ranged from 14.10@14.15., c.i.f., as quoted by American agencies. Locally, bids of 13.70@13.75c., f.a.s., have been about the best that have been heard the last day or two, and there are few at that.

Lead Prices Unchanged

In contrast to the markets for copper and zinc, business in lead during the week ending today has been in average volume, with prices quotably unchanged. Although there have been suggestions of concessions for June delivery, the business reported, with the exception of one small sale, has been at 7.85c. per pound, which continues to be the official contract price of the American Smelting & Refining Co. in New York. Some sales have been reported at 7.95c. and even 8c. for small lots for prompt shipment in the New York market. In St. Louis, 7.65c. appears to be the bottom price, with the exception of one good-sized order for June delivery that went for 7.625c. On the other hand, 7.70c. has been realized on two good sales, one of them for June. Deliveries on specifications against contracts in the New York district for May continue in the same moderate volume as prevailed in April. Great Britain normally consumes about 20,000 tons of lead monthly. Accordingly, if the strike continues for any length of time, and manufacturing is at a complete standstill, this quantity of metal will be thrown on other markets, as no letup in production is to be anticipated. Such a development naturally would be reflected on prices. One observer of the market trend suggests that consumers who foresee an early settlement should buy at current prices; whereas those who expect the strike to endure should specify average prices for May and June. The principal buyers during the last week have been manufacturers of "blue lead" products, small buyers predominating.

Zinc Purely Nominal

The zinc market has been almost entirely nominal during the entire week, with at least 10 points difference between the prices at which metal was bid and offered. Galvanizers have been out of the market, and brass makers have been even less interested. Plenty of Brass Special is available at about 10 points premium over Prime Western, and High-Grade is quiet at 8⅞@8¼c. delivered in the East. New York prices of Prime Western continue at the freight differential of 35c. per 100 lb. above St. Louis.

Spot Tin Scarce

The May tin position has been particularly tight, and consumers in the United States have been backward about supplying their needs. With available supplies from the Straits definitely limited, shipments of 99 per cent and refined from Britain were counted upon to meet the demand on this side. With the prospect of this source removed for the time being, consumers in this market are scrambling for metal to meet their early requirements. Spot Straits does not exist at the moment, and boats that are expected to arrive soon, carry metal that is already sold and ready to go into consumption. The spread between Straits and 99 per cent has ranged at nearly 3c. per lb. during the week. This, however, reflects the extreme dearth of Straits rather than any large supply of the lower-grade metal.

Silver Up to 66⅛c.

The decline in yen exchange which accounts for the reversal of China's position from a seller to a buyer of silver, together with continued orders for India account, has advanced quotations to 30⅝d. and 66⅛c. respectively in London and New York. The market appears steady at the higher level.

Mexican Dollars: April 29th, 49⅜c.; 30th, 49⅝c.; May 1, 49¾c.; 3rd, 49⅝c.; 4th, 50⅛c.; 5th, 50⅝c.

Foreign Exchanges Weak

The strike in England has had a bad effect on the important foreign exchanges, which have registered many new lows. Closing cable quotations on Tuesday, May 4, were as follows: Francs, 3.21¼c.; lire, 4.01⅛c.; and marks, 23.81c. Canadian dollars, ⅛ per cent premium.

Zinc Blende and Lead Ore Both Lowered

Joplin, Mo., May 1, 1926

Zinc Blende

High	$52.10
Premium blende, basis 60 per cent zinc	$46.00@47.00
Prime Western, basis 60 per cent zinc	45.00
Fines and slimes, 60 per cent zinc	44.00@42.00
Average settling price, all zinc	45.63

Galena

High	$102.20
Basis 80 per cent lead	92.50
Average settling price all	99.11

Shipments for the week: Blende, 16,390; lead, 2,408 tons. Value all ores the week, $1,085,690.

A number of mines that could not be operated at a profit on the price level were closed last week, and a larger number are reported to close tonight, with a further reduction in prices offered this week. Production was lowered this week to around 15,000 tons, a restriction of 4,000 tons per week from the peak production in February.

It is noted that a larger tonnage of load was shipped this week, and it is rumored that a considerable amount of this was sold two weeks ago on a premium price offer. The basis price was lowered $2.50 per ton today.

Platteville, Wis., May 1, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$48.50
Lead Ore	
Lead, basis 80 per cent lead	$97.50

Shipments for the week: Blende, 1,256 tons; lead, 80 tons. Shipments for the year: Blende, 17,783; lead, 512 tons. Shipments for the week to separating plants, 1,850 tons blende.

Steel Weak—Pig Iron and Coke Dull

Pittsburgh, May 4, 1926

Only a slight further decrease in the volume of steel buying is to be recorded. The rate may be estimated roughly at 50 to 60 per cent of capacity, but is probably nearer the lower figure. The decrease has been general, but is more marked in the heavy rolled products, bars, shapes and plates, and in sheets.

Steel prices are definitely weaker at several points. Concessions are more common on bars, shapes, and plates, though regular asking prices are unchanged. Black and galvanized sheets are quotable $2 a ton lower.

Pig Iron.—The market continues extremely dull. Prices are maintained but are subject to no real test. Bessemer, $19.50; basic, $18.50; foundry, $19, f.o.b. Valley furnaces.

Connellsville Coke.—Spot prices are not quotably changed, at $3@$3.15 for furnace and $4@$4.50 for foundry.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified.

Aluminum—99 per cent, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 long ton. Domestic demand good. Fair business in Great Britain. Norwegian production well maintained.

Antimony — Per pound, New York, duty paid: Chinese brands, spot, 16½@13c.; June arrival, 15@12½c. Cookson's "C" grade, spot, 22c. Market entirely nominal.

Chinese needle, lump, 15c. Standard powdered needle, 200 mesh, 18½c. White oxide, Chinese, 99 per cent Sb_2O_3, 18@19c. Nominal; little business.

Bismuth—$2.70@$2.75 per lb. in ton lots. London, 10s.

Cadmium—60c. per lb. London, 2s. 2d. for American metal; 1s. 9d. for Australian metal.

Cobalt—Shot, 96@98 per cent, $2.50 per lb. Black oxide, 70 per cent, $2.10; gray oxide, 75 per cent, $2.25. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray. Market for metal slow; for oxides, normal. Union Minière production may be larger than expected, and prices may be affected adversely.

[1]Germanium Oxide—25 to 50 gm. lots, $6 per gm.

Iridium—$190@$200 per oz. for 98@99 per cent. Nominal. London, £70@£75 for 99.5 per cent.

[1]Lithium—95@96 per cent grade in 1 to 5 lb. lots, $65 per lb.

Magnesium—Ingot, 75@80c. per lb. in ton lots, depending on quality; best 99.85 per cent. Quiet market for domestic consumption. Foreign demand better. More progress in using magnesium alloys in Europe than here.

London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]Molybdenum—99 per cent, $25 per kg.; C. P. metal, $80 per kg.

Monel Metal — Base price for shot, 32c. per lb.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade). Market less active than recently. Lon-

don, £170@£175 per long ton, according to quantity.

Osmium—$80@$85 per oz.; London, £19@£22.

Palladium—$70@$72 per oz. Crude, $60@$65 per oz. London, £14@£16¼, nominal.

Platinum—Refined, $110 per oz. officially quoted. Sales also at $105@$106. Crude, $103.50. The market is rather demoralized, but the undertone is reported as better in the last few days.

London, £22½@£23½ per oz. for refined, and £21@£22 for crude. Demand limited.

Quicksilver—Per 75-lb. flask, $91@$92. London, £15. San Francisco wires $90.67. Market is firm.

Radium—$70 per mg. radium content.

Rhodium—$75@$85 per oz.; London, £14@£17. Nominal.

Ruthenium—$75@$85 per oz.; London, £13@£16.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $1.95 per lb. in ton lots.

Tellurium—$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $8 per lb. in 25-lb. lots.

Tungsten Powder—97 to 98 per cent pure, $1.18@$1.20 per pound.

[1]**Zirconium Metal**—98 per cent grade, per lb., $30, in 5 to 10 lb. lots.

Metallic Ores

Chrome Ore—Rhodesian, Indian, New Caledonian, 46-50 per cent, Cr_2O_3, $21@$24, c.i.f. Atlantic seaports; fair demand.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

High-phosphorus foundry, over 0.18 per cent P, $4.15.

Eastern ores, cents per unit delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10½c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 11@11½c.

Spanish low-phosphorous, 52@54 per cent, 11@12c.

Algerian, low-phosphorus, 9½@10½c.

Spanish foundry or basic, 50@54 per cent, 8½@9½c.

Swedish foundry or basic, 66@68 per cent, 9½@10c.

Foreign ores, particularly Spanish, are a little firmer, with better prices.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports: Brazilian, 42c., nominal; Indian, 42c., nominal; Caucasian (unwashed), 40c.; Caucasian (washed), 40@42c.; market dull.

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—55c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, f.o.b. mines. Largely nominal.

Tantalum Ore—Foreign, 50@75c. per lb. of Ta_2O_5 contained, c.i.f. New York.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite $10.75@$11; Western scheelite, $11@$11.50. Domestic demand very light, and prices largely nominal. Large stocks on hand but firmly held for advance in price.

Uranium Ore—Minimum 5 per cent U_3O_8, per pound of U_3O_8 contained, $5. F.o.b. Montrose, Colo.

Vanadium Ore—Containing 4½ per cent V_2O_5 recently has sold at 30@35c. per pound of V_2O_5, f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 60@65c. per pound V_2O_5, duty paid, seaboard.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, per ton:

Crude No. 1, $525; crude No. 2, $300; spinning fibers, $190; magnesia and compressed sheet fibers, $125@$150; shingle stock, $70; paper stock, $40@$45; cement stock, $25; short fibers, $10@$17.50; floats, $15.

The market is good and prices are firm, being official prices quoted by the new consolidated company. Two producers who use their own output have agreed to turn any surplus over to sales agents of merger; two large producers have no agreements with merger.

No. 1 Rhodesian crude, $325; No. 2, $250 per ton, c.i.f. New York. Market excellent, with principal producer well sold ahead.

Barytes—F.o.b. mines, per ton, bags extra:

South Carolina: Crude, $7@$8 per gross ton; ground, off color, $14@$17 per short ton.

North Carolina: White bleached, $22 per short ton; white natural, $20.

Georgia: Barytes ore, washed, $7.50. Demand only fair.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore 93 per cent $BaSO_4$, not to exceed 1 per cent iron, $8, f.o.b. mines.

Canada: 94@96 per cent $BaSO_4$, $9 per net ton, f.o.b. mine.

Bauxite — American, f.o.b. shipping point per gross ton: Crushed and dried, $5.50@$8.50; pulverized and dried, $14; calcined, crushed, $17@$20.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2. $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Prices are largely nominal, as contracts cover most of the 1926 deliveries.

Borax—Carload lots, in bags, per lb.: crystals, 5c.; granulated or powdered, 4¾c.; f.o.b. plant, *Illinois*.

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $30 per ton in carload lots.

Chalk—Crude, in bulk, per ton c.i.f. New York, $4.75@$5.

[1]Price furnished by Foote Mineral Co., Philadelphia.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton: crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$20; ground, $7@$10.

Georgia, washed lump, $8.65; *Florida*, washed lump. $13. Mineral flour, $20. Market better.

1A grades, domestic, $16@$18, f.o.b. *Delaware* plants. Market fair.

Imported English, f.o.b. American ports: Pottery, white ware, $18.50@$21; paper clay, $17.50.

Diatomite—Per short ton, f.o.b. plant, *California:*

Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40. "Calatom" (mill run), $14@$16 depending on quantity; market quiet.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

Feldspar — F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $6@$6.25 per long ton, depending upon quality. Market dull.

New Hampshire: No. 1 not over 10 per cent SiO_2, $8.50 per short ton; pottery grade, $7.50. Ground, $17. Market fair.

New York: Per ton, f.o.b. cars, No. 1 crude, $9. Market good.

Maine: No. 1, ground, $19 per ton.

Tennessee: No. 1 pottery, $16@$18 per ton for 140 and 200 mesh respectively. No. 1 enamel, 140 mesh, $14; 200 mesh, $16. Competition keen with some cutting of prices to get business, but demand good.

Maryland: 140 mesh, $18@$22; 120 mesh, $16; 60 to 100 mesh, $12@$15.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per short ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $18. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50. Acid lump, 98-1, $30 in car lots. Acid ground packed in bags, $40@$45. Fair tonnage sold; quiet. Strong competition.

New Mexico: 85-5 gravel, $15.75; 80-6 gravel, $15 f.o.b. mines. Ground, 96 per cent through 100 mesh, $35. Market good.

Fuller's Earth—Per ton, f.o.b. *Midway, Fla.:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh "up," $8; 200 mesh "up," $15. Market somewhat stronger.

Powdered, imported, duty paid, $23@$25 per ton.

Garnet—Per ton f.o.b. mines:

Domestic, $85.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Jet asphaltum, $36; selects, $33; seconds (ordinary grades), $25.50; peerless black, $32.90. Market good.

Graphite—F.o.b. New York, per lb.:

Ceylon lump, 9@9.75c.; chip, 7½@8½c. dust, 3½@7c. Madagascar flake, 7½@9c.

Market quiet, but prices for imported product marked up.

Flake, 10@20c. according to grade; fine ground crystalline, 7@10c.; amorphous ground graphite, 4@8c. Crude amorphous graphite, $15@$35 per ton according to grade. Prices firm; market easier.

Greensand—Per ton, f.o.b. cars, *New Jersey:* screened and bagged, best grade in carload lots, $30. Good spring business has developed.

Gypsum—Per ton f.o.b. mill, depending upon location: Crushed, $2.75@$3; ground, $4@$6; agricultural, $6@$11; calcined, $7@$13.

[1]**Ilmenite**—Concentrates, 52 per cent TiO_2, 1½c. per lb., f.o.b. *Virginia* points. $60 per short ton, *Florida* mines.

Iron Oxide (See Ocher)—Standard Spanish red, 3@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite**—$20@$30 per ton for ordinary grades. Nominal.

Limestone—F.o.b. shipping points, depending on location: crushed, ½ in. and less, 90c.@$2; 3 in. and larger, 90c. @$1.80 per ton.

Agricultural, $1.50@$5 for pulverized; 75c.@$2 for crushed, depending upon source, purity, and fineness.

Magnesite—Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $45; dead burned, $35; crude, $14. Market good.

Mica—F.o.b. plant, per ton:

North Carolina: 20 mesh, roofing, $38; 100 mesh, white ground, $70. Market good.

New Hampshire: Mine run, $380, clean shop scrap, $25; mine scrap, $20. White, dry ground, 20 mesh, $35; 40 mesh, $45; 60 mesh, $60; 100 mesh, $75; 200 mesh, $85. Market good.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: special grade, $3@$3.25; No. A 1, $2.75; No. 1, $2.50; No. 2, $2.20; No. 3, $1.20; No. 4, 60@70c. No. 5, 42@45c. Grades depend on size of sheets.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher — F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $25@$28; second grade, 99 per cent through 225 mesh, $19. Market good.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent, $6; 70 per cent, $4.50; 68 per cent, $4.10. Market firm with good demand especially for the lower grades.

Florida, pebble, domestic: 76@77 per cent, $6; 75 per cent, $5.25; 74@75 per cent, $5; 70 per cent, $3.50; 76@78 per cent special, $6.50. Market dull but prices firm.

Tennessee, lump, 3-in. screen, base 75 per cent, $6. Ground, 95 per cent through 100 mesh, base 65 per cent, $7.25; 70 per cent, $8.25. Market slow at the moment, but orders for fall shipment in hand.

Potash—	Bags	Bulk
Muriate of potash 80@85 per cent, basis 80 per cent	$34.90	$33.65
Sulphate of potash 90@95 per cent, basis 90 per cent	45.85	44.60
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent	21.00	18.00
Manure salt 20 per cent	14.85	11.85
Kainit 14@16 per cent	11.75	8.75
Kainit 12.4 per cent	11.25	8.25

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons. Prices guaranteed against sellers' decline until April 30, 1927. Prices for manure salts and Kainit increased by from 25c. to $1.50.

Pumice Stone—In barrels, per lb., powdered, 3@5c.; selected lumps, 6@ 8c.; lumps in bags, 4@6c.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports; guaranteed 48 per cent sulphur, furnace size, 13½c. Cinder from ore to remain property of buyers. Market firm, with good inquiry.

[1]**Quartz Rock Crystals**—Colorless, clear and flawed, pieces ½ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Rutile—*Virginia*, per lb.; granular, 94@96 per cent TiO_2, 12@15c.; pulverized, 100 mesh, 94@96 per cent, 17@ 30c.

Florida 93 per cent TiO_2, $200 per ton.

Silica—Water ground and floated, per ton in bags f.o.b. *Illinois:* 450 mesh, $31; 350 mesh, $26; 250 mesh, $18.

Glass sand, f.o.b. producing plant, $1.25@$5 per ton; brick and molding sand, 40c.@$2; blast sand, $2@$4.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$18 per ton for domestic, f.o.b. *Texas* mines; $22 for export, f.a.s. Atlantic ports. Good shipment against contracts. Open prices $1 higher.

Talc—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $11; 96 per cent through 200 mesh, medium white, $10; packed in 50-lb. paper bags. Demand fair, buyers reluctant to anticipate requirements.

New York: Double air-floated, 100 mesh, $11.25; 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $9@$12; market fair.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri*: Once ground through 40 mesh: rose and cream colored, $16. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh: rose and cream, $25; mill run, $15. Active business at lower prices.

[1]Price furnished by Foote Mineral Co., Philadelphia.

[1]**Zircon**—Freight allowed east of Mississippi River: 95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

Mineral Products

Arsenious Oxide (white arsenic)—3½c. per lb. Several cars sold. London, £14@£15 per long ton.

Copper Sulphate — Large crystals, 4.75@4.95c. per lb. depending on quantity; small crystals, same.

Sodium Nitrate—Spot, crude, $2.63@ $2.68 per 100 lb., ex vessel Atlantic ports.

Sodium Sulphate — $1.10@$1.15 per 100 lb., f.o.b. works, for Glauber's salt.

Zinc Oxide—Per lb. in bags, in car lots: Lead-free, 7½c.; 35 per cent leaded grades, 7⅝c.; French, 10½c.

Ferro-Alloys

[1]**Ferrocerium**—$7 per lb.

Ferrochrome—1@2 per cent carbon, 23@25c. per lb. of contained chromium; 4 to 6 per cent carbon, 10½@12c. per lb.; 0.1 per cent, 35c. per pound. Market active.

Ferromanganese — Domestic, 78@82 per cent, $88@$90 per gross ton. British product held at $110, seaboard, duty paid. Spiegeleisen, 19@21 per cent, $33 f.o.b. furnace; 16@19 per cent, $32.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. Ala. and Tenn.

Ferrosilicon—14 to 16 per cent, $42 @$47 per gross ton, f.o.b. works; 50 per cent, $85 delivered in carload lots; 75 per cent, $145. Market active.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1.10@$1.15 per lb. of contained W, f.o.b. works, according to grade.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium — Per lb. of V contained, f.o.b. works, $3.25@$4, depending on grade and delivery.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, 16c.

Nickel Silver—29½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 19⅞c. per lb.; rods, 16⅞c. per lb.

Zinc Sheets — 11.25c. per lb., f.o.b. works.

Lead Sheets — Rolled, 11½c.; clipped, 11⅜c.

Refractories

Chrome Brick—$45@$46 per net ton, f.o.b. shipping point.

Fireclay Brick—First quality, $43@ $46 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick—$40 per M. Pennsylvania and Ohio; $48@$52 Alabama.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1925	1926	1925	1926	1925	1926
January	68.447	67.795	32.197	31.322	477.702	485.295
February	68.472	66.773	32.245	30.797	476.886	485.852
March	67.808	65.880	31.935	30.299	477.279	485.605
April	66.899	64.409	31.372	29.682	479.034	485.702
May	67.580	.....	31.276	.....	484.960	.....
June	69.106	.....	31.863	.....	485.553	.....
July	69.442	.....	31.954	.....	485.514	.....
August	70.240	.....	32.268	.....	485.264	.....
September	71.570	.....	32.983	.....	484.270	.....
October	71.106	.....	32.972	.....	483.909	.....
November	69.223	.....	32.155	.....	484.201	.....
December	68.889	.....	31.835	.....	484.538	.....
Year	69.065	.....	32.088	.....	482.426	.....

New York quotations cents per ounce troy, 999 fine, foreign silver. London pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1925	1926	1925	1926	1925	1926
January	14.709	13.822	66.065	59.013	70.607	65.325
February	14.463	13.979	64.714	59.669	69.525	66.375
March	14.004	13.859	62.892	58.603	67.739	65.489
April	13.252	13.706	60.575	57.200	64.194	64.600
May	13.347	.....	60.131	.....	63.560	.....
June	13.399	.....	59.899	.....	63.369	.....
July	13.946	.....	61.467	.....	65.750	.....
August	14.490	.....	61.613	.....	68.169	.....
September	14.376	.....	61.886	.....	67.693	.....
October	14.300	.....	61.977	.....	67.523	.....
November	14.353	.....	61.280	.....	67.893	.....
December	13.866	.....	59.540	.....	65.625	.....
Year	14.042	.....	61.920	.....	66.804	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London		
	1925	1926	1925	1926	1925	1926	1926 3 M
January	10.169	9.255	9.953	9.102	41.443	34.778	34.584
February	9.428	9.154	9.126	8.991	37.944	33.903	33.903
March	8.914	8.386	8.578	8.165	36.804	31.625	31.921
April	8.005	7.971	7.662	7.764	32.791	28.775	29.284
May	7.985	.....	7.780	.....	32.283	.....	.....
June	8.321	.....	8.024	.....	33.479	.....	.....
July	8.151	.....	8.054	.....	34.698	.....	.....
August	9.192	.....	9.284	.....	38.188	.....	.....
September	9.508	.....	9.303	.....	38.884	.....	.....
October	9.513	.....	9.299	.....	39.017	.....	.....
November	9.739	.....	9.578	.....	36.872	.....	.....
December	9.310	.....	9.157	.....	34.739	.....	.....
Year	9.020	.....	8.817	.....	36.429	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1925	1926	1925	1926	1925	1926
January	57.692	61.415	58.250	2.275	265.560	282.038
February	56.517	62.653	57.068	63.705	262.181	287.107
March	53.038	63.472	53.733	64.505	245.682	292.288
April	51.380	61.962	52.135	63.389	237.006	281.388
May	53.675	.....	54.620	.....	245.476	.....
June	54.885	.....	55.957	.....	252.476	.....
July	56.683	.....	58.014	.....	258.435	.....
August	56.649	.....	58.190	.....	258.538	.....
September	56.405	.....	58.247	.....	259.182	.....
October	60.462	.....	62.274	.....	277.722	.....
November	62.136	.....	63.304	.....	284.506	.....
December	61.952	.....	62.928	.....	284.920	.....
Year	56.790	.....	57.893	.....	260.974	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London		
			1925		1926
	1925	1926	Spot	1926	3 M
January	7.738	8.304	37.917	38.059	37.363
February	7.480	7.759	36.528	36.053	35.956
March	7.319	7.332	35.741	34.090	34.247
April	6.985	7.001	34.644	32.503	32.863
May	6.951	.....	34.223	.....	.....
June	6.990	.....	34.149	.....	.....
July	7.206	.....	34.894	.....	.....
August	7.576	.....	36.691	.....	.....
September	7.753	.....	37.435	.....	.....
October	8.282	.....	39.884	.....	.....
November	8.614	.....	39.039	.....	.....
December	8.565	.....	38.327	.....	.....
Year	7.622	.....	36.624	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)		
	New York		New York		Refined New York		Crude
	1925	1926	1925	1926	1925	1926	1926
January	17.428	23.490	81.596	87.960	117.000	118.200	113.20
February	19.795	21.676	79.386	87.580	117.000	113.909	108.341
March	15.553	19.708	80.481	88.194	117.000	112.000	106.278
April	12.553	17.462	82.327	89.769	118.269	111.538	103.731
May	15.770	.....	81.360	.....	119.850	.....	.....
June	16.500	.....	83.154	.....	120.000	.....	.....
July	17.779	.....	83.077	.....	120.000	.....	.....
August	17.683	.....	82.317	.....	120.000	.....	.....
September	17.143	.....	81.730	.....	120.000	.....	.....
October	18.029	.....	83.856	.....	120.000	.....	.....
November	20.000	.....	88.250	.....	120.000	.....	.....
December	21.692	.....	90.000	.....	120.000	.....	.....
Year	17.494	.....	83.128	.....	119.093	.....	.....

(a) Antimony quotations in cents per pound for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1925	1926	1925	1926	1925	1926
January	24.66	22.76	23.76	21.76	23.76	22.26
February	24.50	22.76	23.26	21.76	23.76	22.26
March	24.06	22.76	23.06	21.76	22.91	22.26
April	22.89	21.38	21.76	20.66	22.26	21.05
May	21.57	.....	20.26	.....	21.16	.....
June	20.76	.....	19.76	.....	20.11	.....
July	20.76	.....	19.76	.....	20.26	.....
August	20.76	.....	19.76	.....	20.26	.....
September	21.04	.....	20.03	.....	20.50	.....
October	21.50	.....	20.37	.....	20.83	.....
November	22.64	.....	21.58	.....	22.08	.....
December	22.76	.....	21.76	.....	22.26	.....
Year	22.33	.....	21.26	.....	21.68	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1925				1926	
	Oct.	Nov.	Dec.	Jan.	Feb.	March
Alaska shipments	3,140	4,677	2,880	3,644	2,55e	3,150
Calumet & Arizona	2,117	2,070	1,682	1,737	1,795	2,010
Magma	.....	.....	.....	1,208	1,095	1,255
Miami	2,052	2,090	2,112	2,228	2,109	2,336
New Cornelia	2,734	2,150	3,604	3,664	2,986	3,641
Nevada Con.	.....	.....	9,777†	.....	.....	.....
Old Dominion	1,097	958	1,217	1,291	1,080	1,111
Phelps Dodge	6,636	6,500	6,957	7,586	6,949	7,440
Ray Con.	.....	.....	18,025†	.....	.....	.....
United Verde Extension	1,797	1,632	1,874	1,987	1,764	1,784
Utah Copper	.....	.....	26,723†	.....	.....	.....
Tennessee Copper	596	573	604	555	503	543

Foreign

Boleo, Mexico	854	798	773	771	820	898
Furukawa, Japan	1,613	1,349	1,579	1,409	1,386	.....
Granby Cons., Canada	1,738	1,396	1,927	1,438	1,482	1,763
Katanga, Africa	8,703	8,207	6,703	6,827	6,810	7,097
Mount Lyell, Aust.	.....	.....	1,805	.....	.....	†2,002
Sumitomo, Japan	1,742	1,553	1,683	1,188	.....	.....

†Three months.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1924		1925		1926	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	66,631	2,149	74,789	2,412	71,026	2,291
February	65,681	2,265	68,967	2,463	68,131	2,433
March	65,181	2,102	74,901	2,416	75,450	2,434
April	66,073	2,202	70,667	2,356	.....	.....
May	65,608	2,116	70,574	2,276	.....	.....
June	63,933	2,131	59,894	2,330	.....	.....
July	64,787	2,090	68,507	2,210	.....	.....
August	66,756	2,153	68,090	2,196	.....	.....
September	63,800	2,127	67,720	2,272	.....	.....
October	68,989	2,225	71,042	2,292	.....	.....
November	68,291	2,276	67,400	2,247	.....	.....
December	67,647	2,182	69,566	2,244	.....	.....
Total	793,377	.....	842,117	.....	214,607	.....
Monthly average	66,115	.....	70,176	.....	71,536	.....
Average of daily rate	.....	2,168	.....	2,307	.....	2,384

Company Reports

Anaconda Report Shows Big Increase in Earnings

Net profits of the Anaconda Copper Mining Co. and its subsidiary companies during 1925, after deducting all charges, depreciation, bond interest, and discount, amounted to $17,540,552, against $6,719,215 for the year 1924. The gross income from sales and tolls amounted to $212,770,498, against $166,467,901 during 1924. Current assets at Dec. 31, 1925, were $122,292,454, against current liabilities of $25,938,546.

Financial results of operations are shown in the following tabulation:

Consolidated Income Account for the Year Ended Dec. 31, 1925

Expense

Metals and manufactured products in process and on hand at beginning of year		$46,645,598
Ores and metals purchased		73,404,146
Mining, reduction, and refining of metals		45,797,717
Manufacturing expenses, including selling		66,616,862
Cost of merchandise sold and operation of public service companies		2,457,792
Administration and federal taxes		1,939,600
Balance from operations carried down		26,554,238
		$263,415,956
Amount charged off this year for depreciation and obsolescence		$5,049,347
Interest, including discount on bonds, less income from marketable securities		10,482,519
Balance, net income		
Carried to balance sheet	$17,540,532	
Apportioned to minority interest	4,830	17,545,362
		$33,077,229

Income

Sales of metals and manufactured products	$198,698,144
Tolls, royalties, rentals	10,593,875
Sales of merchandise and revenue from public service companies	3,478,477
Metals and manufactured products in process and on hand at end of year	50,645,457
	$263,415,956
Balance from operations brought down	$26,554,238
Income from investments in sundry companies	6,522,991
	$33,077,229

Montana Operations

In 1925 Anaconda at its Butte mines did 34.19 miles of underground development, compared with 25.14 miles in 1924, an increase of 36 per cent. The company mined at Butte 2,847,158 tons of copper ore in 1925 and produced from pumped water 7,990 tons of copper precipitates. Zinc ore mined during the year totaled 25,109 tons.

At Butte, $416,297 was spent on mechanical and electrical equipment in 1925 and authorized expenditures of $2,276,854 for equipping Badger State, Mountain Con., and Belmont mines with electrical hoists for operating to depth of 5,000 ft.

At the reduction works at Anaconda 3,145,626 tons of copper ore was treated. Of this 2,750,735 tons was from the company's own mines, and 363,811 tons of ore was purchased from or treated for other companies.

The company produced 266,864,833 lb. of copper, 9,071,359 oz. of silver, and 38,300 oz. of gold, of which 266,373,956 lb. of copper, 9,054,740 oz. of sliver, and 38,390 oz. of gold were from Anaconda's own ores.

Anaconda milled 419,887 tons of zinc ore in 1925, of which 395,048 tons were purchased from other producers in the Butte district, and recovered from this ore 5,894 tons of lead concentrates and 81,062 tons of zinc concentrates. In 1925 the company produced 8,817,109 lb. of arsenic as a byproduct from its copper smelting.

In 1925 the phosphate plant at Anaconda treated 68,733 tons of phosphate rock and produced 800 tons of merchantable phosphoric acid and 33,660 tons of treble super-phosphate.

Expenditure of $1,180,000 on the Great Falls copper refinery was authorized to increase annual capacity to 300,000,000 lb. from 216,000,000 lb., so as to enable the company to refine in Montana all of its Butte production and permit the sale of that output in the West and Middle West to save freight to Atlantic seaboard. This increased capacity should be available by middle of this year. Great Falls refinery produced 210,552,163 lb. of copper cathodes in 1925, of which 197,952,750 was melted to finished shapes at that plant.

Zinc Plant Expanded

During the year $1,250,000 was spent in increasing capacity of the zinc plant to 240,000,000 lb. a year from 180,000,000. This increased capacity became available soon after Jan. 1, 1926.

The company's zinc plants treated 508,786 tons of zinc ores, all but 26,064 tons being purchased ore and concentrates. The electrolytic plant at Great Falls produced 161,795,891 lb. of zinc, 8,414,359 lb. of zinc dross, 105,200 lb. of cadmium and residues, from which were recovered 20,626,664 lb. of lead, 1,365,762 lb. of copper, 2,631,494 oz. of silver, and 6,369 oz. of gold.

In August the company authorized additions to Great Falls rod mill at estimated cost of $382,000. This extension was partially completed by the end of 1925. The Great Falls wire and rod mill last year rolled 133,851,764 lb. of copper rods, drew 40,867,277 lb. of wire, and made 14,453,655 lb. of this wire into strand.

American Brass Established New Record

Anaconda's subsidiary, the American Brass Co., in 1925 established a new record by turning out 653,268,973 lb. of finished product copper, brass, and nickel-silver products, surpassing the 1924 record by 133,519,308 lb., or 26 per cent. In 1925 the company expended at the American Brass plants $1,210,715 on improvements to building and machinery.

The capacity of the Raritan copper refinery is to be increased to 45,000,000 lb. from 38,000,000 a month by expenditure of $1,600,000, materially reducing the cost of refining through improvements in power arrangements and the installation of new equipment, and enabling handling at Raritan of the Andes production by the time that subsidiary in Chile is making copper. The Raritan works in 1925 refined 405,803,075 lb. of copper, 20,578,003 oz. of silver, and 128,590 oz. of gold, together with other miscellaneous metal output.

At the Tooele plant of the International Smelting Co., Anaconda's custom copper and lead smelting subsidiary, the concentrator treated 284,766 tons of ore, from which were recovered 93,323 tons of concentrates. Of this total 40,696 tons were zinc concentrates shipped to the Great Falls electrolytic zinc refinery for further treatment.

The copper smelter treated 78,761 tons of copper ores and concentrates, from which were produced 20,669,490 lb. of fine copper, 1,735,051 oz. of silver, and 15,821 oz. of gold.

The lead furnaces at Tooele smelted 234,046 tons of ore and concentrates, from which were produced 112,105,154 lb. of lead, 6,744,037 oz. of silver, and 18,019 oz. of gold.

At Miami, Ariz., the smelter treated 387,789 tons of concentrates and purchased ores from which were produced 177,227,211 lb. of copper, 536,498 oz. of silver, and 9,737 oz. of gold.

Output at East Chicago Plant

The lead refinery at East Chicago, Ind., treated 67,137 tons of lead bullion, from which 124,616,850 lb. of common lead, 6,592,715 lb. of antimonial lead, 7,571,423 oz. of silver, and 21,932 oz. of gold were produced. At East Chicago and Akron, Ohio, the company produced 44,797,773 lb. of merchantable zinc oxide. The East Chicago plant also produced 11,323,101 lb. of barreled white lead and sold 12,101,288 lb.

Regarding the Andes Copper Mining Co., the report says that work at the property has been carried forward at a very satisfactory rate, and at end of the year was in advance of delivery of structural material and equipment for the smelter and crushing plant.

Texas Gulf Sulphur Co.

For the three months ended March 31, 1926, the Texas Gulf Sulphur Co. made net earnings of $1,930,624. With this amount added, its total surplus and reserve for depletion at March 31, 1926, was $7,583,399, after having paid a dividend of $1,587,500 on March 15, 1926. During these three months the company also increased its reserves, including reserve for depreciation and for unpaid federal taxes (accrued), by $122,741, making the total of these reserves $6,406,051 at March 31, 1926.

Nipissing Profits Declined in 1925

The operations of the Nipissing Mines Co., Ltd., for which the Nipissing Mining Co. conducts operations at Cobalt, Ont., covering the last year, were less profitable than heretofore, largely because the ore mined and milled contained on the average over 10 oz. less silver per ton than in 1924. The average silver content per ton of ore milled was 25.78 oz., against 36.36 oz. in 1924. Production cost was 45.86c. per ounce, or about 9c. per ounce more than in the previous year. The production of fine silver was 2,212,000 oz., or about 800,000 oz. less than in 1924. A total of 91,000 tons of ore was mined, this being about 5,000 tons more than in the previous year. Net value of all Nipissing shipments was $1,687,000. The net income of the operating company was $658,384.46. Known ore reserves contained 1,006,000 oz. of silver, or approximately 500,000 oz. less than a year ago.

Statement of Operations for the Year Ended Dec. 31, 1925

Gross settlements		
Bullion and residue shipments (paid for in 1925)		$2,326,113.93
Gross value of ore, bullion and residue at mine Dec. 31, 1925		1,005,900.02
		$3,332,013.95
Less gross value of custom ore purchased, inventories at Dec. 31, 1924, etc		1,735,975.28
Gross value of 1925 Nipissing production		$1,596,038.67
Cost of mining and all other expenses (including smelter deductions, treatment, and other charges)		1,014,449.67
Net income from 1925 production		$581,589.00
Add interest on bonds, etc		163,446.24
		$745,035.24
Less cost of work on outside properties		86,650.78
Net profit		$658,384.46
Surplus, Jan. 1, 1925		4,501,233.12
		$5,159,617.58
Less dividends declared and paid during 1925	$575,000.00	
Dividends payable Jan., 1926	180,000.00	755,000.00
Net surplus—per balance sheet		$4,404,617.58
This net surplus is made up as follows:		
Cash in various banks		$1,189,599.33
Ore bullion and residue on hand at mine, etc		1,112,051.73
Canadian government, provincial, U. S. railroad and industrial bonds		2,242,960.78
Investments in outside properties		183,969.75
Supplies		87,655.86
		$4,816,237.45
Less accrued expenses on ore, bullion, and residue on hand	$21,109.17	
Accounts payable, including taxes	210,510.70	
Dividend payable—Jan., 1926	180,000.00	411,619.87
Net surplus		$4,404,617.58

Current assets total $2,389,306, against current liabilities of $411,619.

Cerro de Pasco Inventories Increased $3,000,000 in 1925

The following consolidated accounts of the Cerro de Pasco Copper Corporation and subsidiaries cover operations in Peru during 1925:

Expenditures

Inventory—copper, silver, and gold—Dec. 31, 1924	$4,863,822.30
Operating, smelting, shipping, refining, and administration	11,217,005.08
Custom ores	2,510,938.23
United States and foreign taxes	1,232,523.68
Balance—to consolidated surplus account	10,337,615.10
	$30,161,904.39

Income

Sales—copper, silver, and gold	$19,962,342.00
Freight and passenger earnings	1,414,014.04
Dividends, interest, and miscellaneous earnings, etc	590,844.67
Inventory—copper, silver, and gold—Dec. 31, 1925	8,194,703.68
	$30,161,904.39

Consolidated Surplus Account

Balance—Dec. 31, 1924		$1,767,437.01
Reserves for depletion and depreciation		4,321,451.22
Dividends paid		
No. 1925		
29—Feb. 1	$1,122,692.00	
30—May 1	1,122,842.00	
31—Aug. 1	1,122,842.00	
32—Nov. 1	1,122,842.00	
33—Dec. 22	1,122,842.00	5,614,060.00
		$11,702,948.23
Balance of income for year ended Dec. 31, 1925, from consolidated income and expenditures account		$10,337,615.10
Balance—Dec. 31, 1925, per consolidated balance sheet		1,365,333.13
		$11,702,948.23

Tonopah-Belmont Development Co.

During 1925 the Tonopah-Belmont Development Co. produced from its Belmont mine, at Tonopah, Nev., 31,034 dry tons of ore. The Tonopah Mining Co.'s mill treated 31,034.2 dry tons of Belmont ore, with a gross metal content of 7,194.733 oz. of gold and 679,334.54 oz. of silver, with a gross value of $616,174.12; 0.232 oz. of gold and 21.89 oz. of silver, having a combined value of $19.855 per ton. Freight, milling, and metal losses aggregated $6.237 per ton, leaving a net value of $13.618 per ton, or $422,627.89. Total operating cost was $11.639 per ton, or $361,220.62, for the year's operation, leaving a net profit of $1.979 per ton ore mined, or $61,407.27 profit.

Nevada Consolidated Earned $3,368,258 in 1925

Operating earnings of the Nevada Consolidated Copper Co. for the year 1925 totaled $3,368,258. After normal and regular charges for depreciation of plant and equipment, the net amount of earnings credited to surplus was $2,696,807.96, approximately $1.35 per share of capital stock.

During the year there was produced a total of 73,653,886 lb. of refined marketable copper, the unit cost of which, excluding federal income taxes, but including all other taxes and all fixed and general expenses and book entries covering regular monthly charges for depreciation of plants and equipment, and after crediting the net return for precious metal contents and miscellaneous earnings, was 10.39c. per pound, as compared with a cost of 10.70c. per pound for refined copper produced in the preceding year.

As stated in the report to stockholders for the year ended Dec. 31, 1924, preparations were under way for mining by underground methods the extensive ore deposits known to exist at depth and laterally surrounding the orebodies of the steam-shovel pits as at present developed. Activities in this direction have been carried forward during the year by beginning the sinking of a five-compartment working shaft on the Wedge claim, and the installation of hoisting equipment of capacity sufficient to meet the immediate requirements.

The report gives a complete recalculation of ore reserves remaining unmined as of Dec. 31, 1925. This recalculation includes new ore occurrences as well as lower-grade material between and adjoining previously calculated ore sections, all of which must be mined together. It also includes the dilution factor of all underground tonnage as experienced in these operations in the past. The result of this new basis of calculation is in close accord with diluted grade and correspondingly increased tonnage as it will actually be mined, and gives an ore reserve remaining on Dec. 31, 1925, of 84,584,114 tons, averaging 1.456 per cent copper.

Statement of Operations for the Year Ended Dec. 31, 1925

Operating revenue		
Copper produced—73,653,886 lb. @ 14.054c		$10,351,437.26
Gold produced—35,123.838 oz. @ $20.503		720,159.42
Silver produced—131,168.09 oz. @ 69.111c		78,211.93
		$11,149,808.61
Operating expenses		
Mining, including proportion of stripping expense	$2,756,460.97	
Ore delivery—mine to mill	564,513.26	
Milling	2,030,262.66	
Smelting	1,684,808.13	
Freight and refining	1,106,765.49	
Selling commission	91,859.30	8,234,669.81
Profit from operations		$2,915,138.80
Miscellaneous income		453,119.20
Total income		$3,368,258.00
Charges against income		
Depreciation		671,450.04
Net income to surplus account		$2,696,807.96

Surplus From Operations

Balance—Dec. 31, 1924	$7,552,001.68
Net income for year (without deduction for depletion)	2,696,807.96
	$10,248,809.64
Less capital distributions	499,864.25
Balance of surplus—Dec. 31, 1925	$9,748,945.39

Current assets on Dec. 31, 1925, were $10,937,993, compared with current liabilities of $1,349,857.

New York & Honduras Rosario Mining Co.

The following figures give the salient features of the record of the New York & Honduras Rosario Mining Co. during 1925 and a comparison with the preceding year.

	1925	1924
Dry tons treated	105,850	75,710.41
Ounces silver produced	2,431,926.17	2,189,903.69
Ounces gold produced	3,994.367	4,339.234
Average silver recovery at mine, per cent	91.93	90.68
Average gold recovery at mine, per cent	93.89	94.61
Average ounces silver recovered at mines, per ton	25.075	28.886
Average ounces gold recovered at mine, per ton	.0409	.0585
Value per ounce of silver sold	$0.6910	$0.6826
Cost of silver recovered, per ounce	0.3864	0.3514
Net profit on silver recovered, per ounce	0.3046	0.3312

Earnings

The net operating income for the year was	$1,697,847.71
Less operating expenses	894,830.04
Operating profit	$803,017.67
Less New York administrative expenses	62,288.60
Net income from operations	$740,729.07
Miscellaneous income	90,682.70
	$831,411.77
Less miscellaneous expenses	67,226.70
Net profit for year	$764,185.07
Less appropriation for reserves	232,477.24
Net profit before taxes	$531,707.83
Less federal income tax	50,998.41
Net earnings for year	$480,709.42
Applied to dividends	400,000.00
Carried to surplus	$80,709.42
Current assets Dec. 31, 1925	2,591,623.80
Current liabilities Dec. 31, 1925	278,038.63

North Star Reports Deficit of $142,574

The 1925 annual report of the North Star Mines Co., operating at Grass Valley, Calif., states that production was $774,941, outlays for current operation were $671,117; for development, $399,184, of which $137,170 was charged to the current expenses; and the balance, $262,014, was carried on the books as a temporary asset. Total amount charged to operation and development was $808,287, exceeding the production by $33,346. From interest and dividends on invested funds $38,012 was received and $17,755 realized as profit on sale of investments; $22,176 was allowed for depreciation; $143,785 written off for loss on the Rainbow option, leaving a net deficit for the year of $142,574. Results of development work are said to have been disappointing.

Dome Earnings Decline

Operations in the Porcupine gold area in Ontario of Dome Mines, Ltd., for the first quarter of 1926 netted as income, before charging depreciation and depletion, of $429,212. This compares with $528,411 in preceding quarter and $544,666 in first quarter of 1925. Comparative figures follow:

	1926	1925	1924
Gross	$1,024,094	$1,053,630	$1,031,933
Expenses	611,838	526,051	565,009
Federal taxes	26,600	26,924	26,635
Balance	$385,656	$500,655	$440,289
Other income	43,556	44,011	65,183
Total income before depreciation and depletion	$429,212	$544,666	$505,472

Imports and Exports of Ores and Metals in March, 1925 and 1926

Compiled from by the U. S. Department of Commerce Records.

In pounds unless otherwise specified

Imports

	March, 1925	March, 1926
Antimony		
Ore { Gross weight	715,106	566,867
Ore { Antimony content	502,444	294,142
Liquated, regulus or metal	1,761,739	2,957,965
Copper		
Ores	6,179,524	7,913,569
Concentrates	2,249,540	7,098,444
Regulus, coarse metal and cement copper	67,629	41,445
Imported from		
Spain	266,652	535,607
Canada	4,341,377	4,128,061
Mexico	2,235,000	2,797,657
Cuba	.....	6,456,186
Chile	1,497,403	382,277
Peru	87,594	81,670
Other countries	68,667	672,000
Unrefined, black, bliste. and converter copper in pigs, bars and other forms	127,513,110	30,015,321
Imported from		
United Kingdom	284,415	16,700
Canada	3,739,696	3,419,804
Mexico	5,962,311	3,735,797
Chile	5,602,705	9,806,825
Peru	2,431,252	7,435,586
Portuguese Africa	9,492,731	5,600,609
Refined copper	7,812,614	8,117,503
Old and clippings for remanufacture	1,224,061	2,975,314
Composition metal, copper chief value	241	111,148
Brass		
Old and clippings for remanufacture	790,573	987,643
Lead		
Ore and matte	8,230,391	11,313,492
Bullion or base bullion	10,747,682	4,429,129
Pigs and bars	5,330,919	878,893
Scrap lead, babbitt metal, solder and other forms (lead content)	1,005	16,665
Type metal and antimonial lead { Gross weight	.....	2,100,126
Type metal and antimonial lead { Lead content	.....	.....
Manganese ore, tons { Gross weight	1,015	237
Manganese ore, tons { Manganese content	23,315	27,391
Pyrites	21,182	14,923
Tin		
Ore, tons	65	65
Bars, blocks and pigs	18,003,308	15,006,076
From		
United Kingdom	1,331,930	3,086,266
British Malaya	13,458,226	11,143,815
Hongkong	2,129,714	22,463
Australia	50,400	22,400
Other countries	1,033,038	731,132
Zinc		
Ore, zinc content	235,565	3,255,157
Blocks, pigs and old	.....	8,148

Exports of Copper, Lead and Zinc

	March, 1925	March, 1926
Copper		
Ores, concentrates, composition metal and unrefined	546,212	43,980
Refined in ingots, bars, and other forms	116,234,349	72,185,100
Exported to		
Belgium	12,302,016	7,144,311
France	13,067,406	22,814,042
Germany	35,169,617	6,905,749
Italy	18,189,968	9,721,840
Netherlands	9,847,480	2,463,874
Spain	575,860	537,596
Sweden	2,479,782	1,278,312
United Kingdom	17,284,989	14,001,990
Other Europe	347,937	528,364
Canada	2,491,712	2,172,106
British India	1,985,167	1,837,135
China	2,240,181	470,400
Japan	.....	2,015,550
Other countries	252,234	293,831
Old and scrap	2,058,754	1,582,547
Pipes and tubes	186,423	150,224
Plates and sheets	679,815	215,946
Rods	4,989,800	3,566,045
Wire	1,308,020	788,898
Insulated copper wire and cable	1,366,733	1,312,052
Lead		
In pigs, bars, and other forms		
From domestic ore	206,991	2,661,252
From foreign ore	18,995,591	4,738,397
Total	19,202,582	7,399,649
Exported to		
Belgium	672,278	672,198
France	1,635,590	1,624,314
Germany	7,170,269	1,456,378
Italy	1,008,263	.....
Netherlands	1,008,223	.....
United Kingdom	5,758,784	1,064,379
Other Europe	672,153	672,803
Argentina	628,966	.....
Brazil	291,713	112,005
Japan	.....	896,529
Other countries	356,343	901,043
Other lead manufactures	1,370,378	1,854,481
Zinc		
Ore and concentrates, tons	893	9,070
Dross	3,440,652	1,351,841
Cast in slabs, blocks or pigs	12,728,260	5,124,675
Exported to:		
Belgium	661,198	336,009
France	1,255,766	1,209,642
Germany	2,117,123	1,624,657
Italy	783,782	448,077
Netherlands	2,455,191	209,407
United Kingdom	4,190,081	1,108,909
Other Europe	526,566	111,982
Argentina	672,236	.....
Other countries	66,317	75,992
In sheets, strips and other forms	786,904	567,735
Dust	331,266	117,807
Other zinc manufactures	62,162	92,431

Mining Stocks—Week Ended May 1, 1926

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Anaconda	New York	48⅛	43⅞	48	Ap.17, My.24	0.75
Arcadian Consol.	Boston	*85	* 80	*80		
Ariz. Com'l	Boston	10⅛	9⅞	10⅛	Jy.21, Jy. 31 SA	0.50
Calaveras	N. Y. Curb	....	....	1⅛		
Calumet & Arizona	New York	61⅛	57⅝	61⅛	Mr.5, Mr.21 QX	1.50
Calumet & Hecla	Boston	15	14⅛	14⅛	Nov.30, De.15 Q	0.50
Cerro de Pasco	New York	65⅞	62½	64⅜	Ap. 15, My. 1, Q	1.00
Chile Copper	New York	33⅛	32⅛	33⅛	Jn.2, Jn.28, Q	0.62½
Chino	New York	21	21	21	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	3⅜	2½	2⅞		
Copper Range	Boston	15½	14⅛	15½	May, 1925	1.00
Crystal Copper	Boston Curb	*33	*30	*32		
East Butte	Boston	3⅛	3	3⅛	Dec., 1919	0.50
First National	Boston Curb	*17	*16	*17	Feb., 1919	0.15
Franklin	Boston	....	....	*75		
Granby Consol.	New York	20½	18½	20½	May, 1919	1.25
Greene-Cananea	New York	10⅜	9⅜	10½	Nov., 1920	0.50
Hancock	Boston	*50	*50	*50		
Howe Sound	New York	32⅜	31½	31½	Ap.1, Ap.15	0.75
Inspiration Consl.	New York	24⅛	22⅝	23⅛	Mar.18, Ap.5, Q	0.50
Iron Cap	Boston Curb	3⅜	3⅛	3⅜	May, 1923	0.15
Isle Royale	Boston	10⅜	10	10⅛	No.30, De.5	1.00
Jerome Verde Dev.	N. Y. Curb	*76	*76	*76		
Kennecott	New York	54⅜	52⅞	54⅛	Ma.5, Ap.15 Q	1.00
Lake Copper	Boston	1⅛	1	1⅛	June, 1925	0.50
Magma Copper	New York	38⅝	37	38⅛	Mh.31, Ap.15, Q	0.75
Mason Valley	N. Y. Curb	2	2	2		
Mass Consolidated	Boston	*35	*25	*33	Nov., 1917	1.00
Miami Copper	New York	12⅛	11⅞	11⅞	My.1, My.15 Q	0.25
Mohawk	Boston	33⅜	32	32⅛	My.1, Je.1 Q	1.00
Mother Lode Coa.	New York	6⅜	6⅛	6⅜	De. 11, De. 31	0.37½
Nevada Consol.	New York	12⅞	12⅝	12⅞	Mh.18, Mh.31 Q	0.25
New Cornelia	Boston	20⅝	20	20	My.7, M.24 Q	0.40
North Butte	Boston	2⅝	2½	2⅝	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*65	*48	*60	No. 14, De. 2	0.05
Old Dominion	Boston	16⅛	15	16	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†127	†122	....	Mar.20, Apr.2 Q	1.00
Quincy	Boston	21	18½	20⅞	Mar., 1920	1.00
Ray Consolidated	New York	12⅞	12½	12⅝	Ap.20, Ap.30	0.25
Ray Hercules	N. Y. Curb	....	....	11⅝		
St. Mary's Min. Ld.	Boston	30⅛	28⅛	30	Ap.17, My.18	2.00
Seneca Copper	New York	5⅜	5⅛	5⅜		
Shannon	Boston	*55	*50	*50	Nov., 1917	0.25
Superior & Boston	Boston	*55	*54	*55		
Tenn. C. & C.	New York	12⅜	11⅞	12⅛	Fe.27, Ma.15, Q	0.25
United Verde Ex.	N. Y. Curb	28⅛	28⅛	28⅛	Ap.6, My.1,	0.75
Utah Copper	New York	100⅛	100	100⅛	Mh.18, Mh.31, Q	1.25
Utah Metal & T	Boston	2⅛	1⅞	2	Dec., 1917	0.30
Victoria	Boston	*60	*60	*60		
Walker Mining	Salt Lake	*92	*73	*73		
NICKEL-COPPER						
Internat. Nickel	New York	37	34⅛	34⅛	My.11, My.31, Q	0.50
Internat. Nickel, pfd.	New York	....	....	102	Ap.15, My.1, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*32	*32	*32	Ja. 1, Ja. 10 M	0.01
National Lead	New York	150	146	147	Ma.12, Ma.31 Q	2.00
National Lead pfd.	New York	118½	117½	117⅝	My.21, Je.15 Q	1.75
St. Joseph Lead	New York	39½	38⅛	38⅛	Je.10, Je. 21 QX	0.75
ZINC						
Am. Z. L. & S	New York	8	7⅛	7⅞	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	31	28⅛	30⅛	Nov., 1920	1.50
Butte C. & Z	New York	5	4⅞	5	De.10, De.24	0.50
Butte & Superior	New York	12⅛	12⅛	12⅛	Ma.15, Ma.31 Q	0.50
Callahan Zn-Ld	New York	1⅜	1⅛	1⅛	Dec., 1920	0.50
Eagle Picher	Cincinnati	28¾	28	28⅞	My. 15, Jn.1	0.40
Eagle Picher, pfd.	Cincinnati	...	...	110	Mh.31, Ap.15 Q	1.50
New Jersey Zn	N. Y. Curb	...	...	208	Ap.20, My.10 Q	2.00
United Zinc	N. Y. Curb	...	...	*70		
Yellow Pine	Los Angeles	*26	*25	*26	De.8, De.18 Q	0.04
GOLD						
Alaska Juneau	New York	1⅜	1⅛	1⅜		
Argonaut	Toronto	*28	*25	*25¾		
Barry-Hollinger	Toronto	*37	*36	*36		
Carson Hill	Boston	*35	*35	*35		
Consol. W. Dome L.	Toronto	*18½	*17	*17		
Cresson Consol. G.	N. Y. Curb	2½	2½	2½	Mh.31, Ap.10	0.10
Crown Reserve	Toronto	*14	*12	*12½	Jan., 1917	0.05
Dome Mines	New York	14½	12⅞	13	Mh.31, Ap.20, Q	0.50
Golden Center	N. Y. Curb	1⅞	1⅝	1⅝		
Golden Cycle	Colo. Springs	....	....	1.51	No.30, Dec.10 Q	0.03
Hollinger Consol.	Toronto	18.30	18.00	18.25	My.4, My.20	0.08
Homestake Mining	New York	55	53½	55½	Ap.20, Ap.26 M	0.50
Kirkland Lake	Toronto	1.20	1.11	1.13		
Lake Shore	Toronto	10 45	10.15	10.25	Ma.1, Ma.15 Q	0.10
McIntyre-Porcupine	New York	26⅜	25⅝	26	My.1, Je.1	0.25
Newray	Toronto	....	....	*35		
Night Hawk Pen.	Toronto	*5½	*5½	*5½		
Noranda	N. Y. Curb	17⅛	15⅞	16⅞		
Portland	Colo. Springs	....	....	*54	Apr.6, Apr.15	0.02
Rand Mines	New York	32¾	32¼	32¾	Fe.16, Fe.26	1.52
Teck-Hughes	Toronto	3.43	3.35	3.35	Ja. 15, Fe. 1	0.05
Tom Reed	Los Angeles	*75	*70	*75	Ma.10 Ma.20	0.02
Tough-Oakes	Toronto	*39	*38	*38⅜		
United Eastern	N. Y. Curb	*38	*38	*38	July, 1924	0.05
Vipond Cons	Toronto	1.65	1.58	1.65		
Wright-Hargreaves	Toronto	8.00	7.90	8.00	Mh.15, Ap.1	1QX 0.07½
Yukon-Alaska Trust	N. Y. Curb	...	...	21⅜		
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	18	17½	17½		
Con. Cortez	N. Y. Curb	...	...	*6		
Con. Virginia	San Francisco	* 8½	7½	*8¼		
Continental Mines	N. Y. Curb	...	...	*45		
Dolores Esperanza	N. Y. Curb	...	...	*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2⅜	2⅛	2⅛	Mh.19, Apr.3 Q	0.08
Tonopah Belmont	N. Y. Curb	2⅝	2 5/16	2⅝	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	*52	*45	*45	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	5⅝	5⅜	5⅜	Ap.7, Ap.21 Q	0.07½
Unity Gold	N. Y. Curb	...	...	*20		
West End Consol.	N. Y. Curb	...	...	*25	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	...	...	*45	June, 1918	0.02

Stock	Exch.	High	Low	Last	Last	Div
SILVER						
Alvarado	N. Y. Curb	....	....	1	Oct., 1920	0.50
Beaver Consol	Toronto	*79½	*77	*77	May. 1920	0.03
Castle-Trethewey	Toronto	1.50	1.41	1.42		
Coniagas	Toronto	....	....	3.75	May, 1924	0.12½
Keeley	Toronto	1.61	1.54	1.54	Ma.1, Ma.15 X	0.12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Ap.1, Ap.15	0.12½
La Rose	Toronto	...	...	*14	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	...	...	*85	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*19	*18	*19	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.70	3.55	3.61	Ja. 16, Ja.30	0.12½
Nipissing	N. Y. Curb	5⅞	5⅛	5⅛	Mh.31, Ap.20, Q	0.15
Temiskaming	Toronto	....	....	*12½	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	8⅞	8½	8¾	Mh.8, Ap.5, Q X	0.25
Alta Merger	Salt Lake	†*5½	†*2½	....		
Bingham Mines	Boston	36½	31½	32	Ma.20, Ma.31 Q	1.00
Cardiff M. & M.	Salt Lake	...	...	*51	De.16, No.18	0.10
Chief Consol	Salt Lake	...	...	3.00	Ap.1, My.1 Q	0.10
Emma Silver	Salt Lake	†1	†*50	....		
Erupcion	Boston Curb	1⅜	1⅛	1⅛	Mh.18, Ap.5, X	0.10
Federal M. & S.	New York	69	69	69		
Federal M. & S., pfd.	New York	76	74¼	76	No.25, De.15 Q	1.75
Hawthorne Mines	N. Y. Curb	*17	*14	*16		
Hecla Mining	N. Y. Curb	17	16¼	17	My.15, Je.15 Q	0.50
Iron King Mining	Salt Lake	...	...	25		
Keystone Mining	Salt Lake	...	...	*40	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*15½	*14	*14½		
Mammoth Mining	Salt Lake	2.60	2.60	2 60	Mar.24, Apr. 1	0.10
Marsh Mines	Spokane	*4½	*3½	*4	Se.15, Oc.1	0.15
Ontario Silver	New York	...	...	10		
Park Utah	Salt Lake	...	...	6.00	Mh.15, Ap.1	0.15
Prince Cons	Salt Lake	*2½	*2½	*2½		
Silver King Coal	Salt Lake	7.40	7.15	7.40	Mh.20, Ap.1, Q	0.25
Silversmith	Spokane	*49½	*47½	*49½	Apr. 1, Apr.10	0.02
Tamarack-Custer	Spokane	*47	*45	*47	Sept., 1924	0.25
Tintic Standard	Salt Lake	12.09	11.00	12.00	Mh.1, Mh.20, QX	0.40
Utah-Apex	Boston	9⅜	8⅝	8⅝	Apr. 9, Apr. 15	0.25
Western Utah Copper	N. Y. Curb	...	...	*8		
IRON						
Bethlehem Steel	New York	41⅞	40	40	July, 1924	1.25
Colorado Fuel & Iron	New York	37⅜	34⅝	35⅜	May, 1921	0.75
Gt. North'n Iron Ore	New York	22⅞	21⅛	21⅛	De. 4, De. 28,	0.75
Inland Steel	New York	39	37⅛	37⅛	My.10, Je.1 Q	0.75
Mesabi Iron	N. Y. Curb	1⅞	1⅜	1⅜		
Replogle Steel	New York	10	9⅞	9⅞		
Republic I. & S.	New York	51	48⅞	49⅛	May, 1921	1.50
Republic I. & S. pfd.	New York	....	....	94⅛	Ma.15, Ap.1, Q	1.75
Sloss-Sheffield S. & I.	New York	115⅛	111⅞	113⅛	Ma.10, Ma.20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	104	104	104	Ma.20, Ap.1, Q	1.75
U. S. Steel	New York	124⅝	120⅝	122⅞	Je.2, Je.29 Q	1.75
U. S. Steel pfd	New York	129	127⅛	128	My.4, My.29, Q	1.75
Virginia I. C. & C.	New York	45	45	45	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York	....	....	73⅛	De.15, Ja.2,	2.50
ALUMINUM						
Alum. Co. of Amer.	Open Market	...	...	65		
Alum. Co. of Amer pf.	Open Market	...	...	99⅛	April, Q	3.50
VANADIUM						
Vanadium Corp.	New York	36	34½	35⅛	My.1, My.15, Q	0.75
ASBESTOS						
Asbestos Corp	Montreal	103	99½	103	De.31, Ja.15 Q	1.50
Asbestos Corp., pfd.	Montreal	123	122	123	De.31, Ja.15, Q	1.50
SULPHUR						
Freeport Texas	New York	33⅛	28⅛	31⅝	Nov., 1919	1.00
Texas Gulf	New York	137½	133½	135½	Ma.1, Ma.15, Q	2.50
DIAMONDS						
De Beers Consol.	New York	...	...	27⅛	Ja.26, Fe.2	0.23
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅛	4	4⅛		
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	51	50⅛	50⅜	My.20, Je.1, Q	1.00
Amer. Metal pfd.	New York	...	...	113⅛	My.20, Je.1 Q	1.75
Amer. Sm. & Ref.	New York	120⅞	115⅛	119⅛	Ap.16, My.1, Q	1.75
Amer. Sm.&Ref.pfd.	New York	116⅝	115⅛	116⅜	My.7, Je.1, Q	1.75
Consol. M. & S.	N. Y. Curb	...	...	208	De.31, Ja.15	0.75
Federated Metals	N. Y. Curb	17⅞	17	17		
Newmont Mining	N. Y. Curb	52⅛	51	52⅞	Mar.31, Apr.15,	0.60
Southwest Metals	N. Y. Curb	....	....	2		
U. S. Sm. R. & M.	New York	40⅛	38⅛	39⅜	Ap.8, Ap.15, Q	0.87½
U. S. Sm. R.&M.pfd.	New York	48⅜	48	48⅜	Ap.8, Ap.15, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Henry Sachs, Colorado Springs, Colo.

PRICE WEEK ENDED APRIL 20th, 1926

Name	High	Low	Last	Last Divd. Date	Amount
Aramayo Mines* (25 frs.)	82/6	81/—	82/6	Feb. 1926	5 p.c.†
British Platinum (£1)	7/—	6/—	6/—	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	15/3	14/9	15/1½	Feb. 1926	6 annas*
Bwana M'Kubwa (5s)	7/6	6/4½	7/4½		
Camp Bird (£1)	4/10½	4/6	4/10½		
El Oro (£1)	6/6	6/—	6/3	Nov. 1924	2½ p.c.*
Esperanza (10s)	1/6	1/3	1/3		
Frontino & Bolivia (£1)	8/6	8/3	8/6	Jan. 1926	1½ p.c.
Mexican Corpn. (£1)	18/—	15/7½	15/9		
Mexico Mines of El Oro (£1)	31/3	30/—	30/—	Dec. 1925	12½ p.c.*
Oroville Dredging (£1)	4/—	3/6	4/—	Dec. 1923	3½ p.c.
Ouro Preto (£1)	2/6	2/—	2/6	May 1925	2½ p.c.
Rhodesian Congo Border	111/3	102/6	111/3		
St. John del Rey (£1)	9/6	8/9	9/3	June 1925	6½ p.c.
San Francisco Mines (10s)	28/9	26/10½	28/—	Jan. 1926	22½ p.c.
Santa Gertrudis (£1)	19/6	18/9	19/—	July 1920	5 p.c.
Selukwe (2s. 6d.)	11/10½	10/3	11/6	April 1917	6¾ p.c.
S. Amer. Copper (2s.)	5/—	4/6	4/9	Nov. 1917	75 p.c.
Tanganyika (£1)	40/7½	37/6	38/9	Sept. 1925	5 p.c.
Tomboy (£1)	3/9	3/6	3/6	Jan. 1926	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	6.050	5.800	5.800	July 1925	150 frs.‡

* Free of British income tax. † Swiss frs. ‡ Belgian frs.